REPORT OF THE SUBORDINATE OFFICERS

OF THE

DEPARTMENT OF AGRICULTURE, MADRAS

FOR

1937-38

MADRAS
PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS
1938

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REPORTS OF SUBORDINATE OFFICERS OF THE DEPARTMENT OF AGRICULTURE, MADRAS, FOR 1936–37.

ADMINISTRATION REPORT OF THE PRINCIPAL, AGRICULTURAL COLLEGE, COIMBATORE, FOR 1937–38.

I held the post of Principal throughout the year 1937–38. I was also Chairman of the Board of Examiners and Examiner in Agriculture and the Chief Superintendent for the University Examinations in B.Sc.Ag. Degree held in April 1937. I attended two meetings of the Academic Council in September 1937, and February 1938, and two meetings of the Senate of the Madras University held in October 1937 and March 1938, and one meeting of Board of Studies in Agriculture in July 1937.

2. *Staff*.—Sri K. Raghava Acharya, Lecturer in Agriculture, was transferred as Assistant Director of Agriculture, Cuddalore, and was relieved on 30th June 1937 by Sri M. U. Vellodi Avargal, Superintendent, Central Farm, who handed over charge of the latter post on 7th July 1937 to Sri S. Narayana Ayya transferred from Tinnevelly. On 16th March 1938 Sri V. G. Dhanakoti Raju relieved Sri S. Narayana Ayya on transfer to Nellore as Assistant Director of Agriculture. Sri H. Shiva Rao, the Lecturer in Chemistry was on leave for 15 days from 17th March 1938. Assistant Lecturers in Agriculture Messrs. E. K. Nambiyar, S. V. Duraiswami Ayyar and V. Suryanarayana were transferred to districts and their places were taken by Messrs. K. Sanjeeva Shetty, K. Ramaswami Ayyar and T. R. Natarajan. Sri T. G. Anantharama Ayyar, Farm Manager, Livestock Research Station, Hosur, was transferred as Farm Manager, Central Farm, early in December 1937 relieving Sri M. K. Swaminatha Ayyar on transfer to Sixth Circle.

Sri G. Krishnaswami Mudaliyar, Lecturer in Animal Hygiene, retired from service with effect from 1st May 1937. His place was taken by Sri P. S. Kuppuswami Ayyar. The Assistant Lecturer in Animal Hygiene, Sri K. Ranganatha Rao was transferred to Tiruppur and was relieved by Sri K. Venkataraman, Veterinary Assistant Surgeon, Tiruppur. Sri K. Sankaranarayana Ayyar, Supervisor, went on leave from 1st March 1938 preparatory to retirement and Sri K. Subrahmanyam was directly recruited in his place.

3. *The College*.—The college reopened after summer vacation on the 15th June 1937, but B.Sc.Ag. Class I was formed only from 2nd July 1937.

4. *Admission.*—One hundred and eighty-four applications were received as compared with 156 in 1936. One hundred and thirty qualified candidates appeared for interview before the Selection Committee at Bezwada and Coimbatore and 42 were selected. Six seats were reserved for failed students who applied for re-admission. On the re-opening date, viz., 2nd July 1937, 40 students (36 newly selected and 4 old students) were present. The remaining eight vacancies were subsequently filled up from the waiting list. The strength of the class on 9th July 1937 was 48 including the four re-admitted students.

The class as divided into linguistic areas and communities was as follows :—

Telugus	**18**
Tamils	**16**
Malabar	**4**
Kanarese	**6**
	44

Brahmans	**18**
Non-Brahmans	**12**
Muhammadans	**2**
Christians	**6**
Backward class	**6**
	44

5. The following short courses in Practical Agriculture were conducted during the year :—

		Number of students.
(i)	Farm Management	14
	Special courses.	
(ii)	Horticulture course	2
(iii)	Insect Pests and Diseases	3
(iv)	Dairying and Malt-making	4
(v)	Care of animals	2
(vi)	Bee-keeping and Jaggery-making	2
(vii)	Farm implements, Machinery, Manuring and Crop improvement.	2

The Farm Management course students, viz., 14 had their training along with other special students in Special Courses mentioned in items (ii) to (vii) above.

6. *Special lectures and tours.*—Eleven special lectures were given to students by various research officers during the session. Besides the weekly short trips to the adjoining villages the third year and the second year had their long tours as usual, the former to fourth and eighth circles and the latter to fifth and sixth circles.

7. *Examinations.*—The number of candidates that appeared for the B.Sc.Ag. Examinations in 1937 and the results were as follows :—

	Number appeared.	Number passed.	
First Examination ..	45	37	
Second Examination ..	37	29	*Plus* 7 who failed in one subject only and were eligible for attending B.Sc. Ag. Class III. Ten candidates referred from the 1936 examinations appeared of whom 7 passed. The other three candidates were referred again in Agricultural Engineering.
Final Examination ..	25	20	Five candidates were referred in one subject. Seven candidates referred from 1936 examination appeared—all passed.

8. *Scholarships.*—Five scholarships were awarded to the first year students, two to Muhammadans and three to backward communities.

The backward scholarship held by A. G. Kesava Reddi during 1936–37 having fallen vacant for the reason that he failed to qualify for promotion to the second year B.Sc.Ag. class was re-allotted to V. Ramalingam, a member of the scheduled class and a third year student.

The Arcot Rajagopala Mudaliyar Vellala Students' scholarship was awarded to K. Linga Reddi, student of B.Sc. Ag. Class 1.

9. *Prizes.*—Fourteen prizes in the shape of medals and books were awarded to successful students at the College Conference in July 1937.

10. *College Council.*—Three meetings of the College Council were held during the year.

Academic Council.—Messrs. H. Shiva Rao and S. N. Chandrasekara Ayyar were elected Members of Madras University Academic Council in the vacancies caused by the transfer of Messrs. K. Raghava Acharya and P. S. Jivanna Rao whose term of appointment as a member of that body ceased from 2nd February 1938.

11. *Miscellaneous.*—Sri Rao Bahadur S. Sundararaman, retired Government Mycologist, delivered the Travancore Curzon Lectures at the Agricultural College on 16th and 17th December 1937.

12. *Hostel.*—The general health of the students was very satisfactory. Four messes were run during the year, the average attendance and daily rates are given below :—

	Average attendance.	Daily rates.		
		RS.	A.	P.
General	44	0	6	11
Telugu	42	0	6	10
West Coast	29	0	7	5
Non-vegetarian	24	0	8	6

13. *Students' Club.*—The inaugural address of the club was delivered by Sri Rao Bahadur B. Viswa Nath, F.I.C., Director of the Imperial Institute of Agricultural Research, Delhi, on the subject of "Agricultural Research." Three general body and six ordinary meetings were convened. The Club Day celebrations were held on the 26th February 1938 when Sri Diwan Bahadur M. Venkatarama Ayyar, retired Deputy Commissioner of Excise, presided and distributed the prizes.

14. *Games.*—Students took an active part in all games. Cricket and tennis were the most popular games. The College Cricket team had a very successful season winning the local Rhondy Shield tournament and reaching the finals in the Madras University Cricket tournament in which St. Aloysius, Mangalore, proved too good for our team. Tennis received considerable attention also and the college courts were always crowded. An additional tennis court is now a necessity.

The College participated in all University Inter-Collegiate tournaments.

15. *Library.*—Three thousand two hundred books and publications and fifty-two periodicals were added during the year. The total number of current periodicals now exceeds 700.

Thirteen thousand seven hundred and thirty-nine volumes were loaned to local and outside officers. Seven hundred volumes were bound.

Bulletins and pamphlets were classified and grouped under subjects and got bound. Nearly 14,000 index cards were added to the card cabinets.

16. *College Day and Conference.*—The twenty-sixth College Day and Conference were held on 22nd and 23rd July 1937 under the presidency of Sri Diwan Bahadur S. E. Ranganathan, Vice-Chancellor of Madras University. The conference was attended by the Director of Public Instruction, Madras, the District Educational Officer, Coimbatore, and a few members of the Madras Legislative Assembly besides the usual members and staff of the department and the members of the Madras Agricultural Students' Union.

The College Day sports were held on 24th July 1937 when Mrs. A. C. Woodhouse kindly gave away the prizes to the winners. In co-operation with heads of sections in the Research Institute a comprehensive exibition of the important lines of work of research pursued by them was held during the days of the conference.

17. *Seed testing.*—Seventy-three samples of seeds were tested and reported on by the Lecturer in Botany.

18. *Veterinary Hospital.*—During the year 525 farm animals and 1,460 out-patients were treated against 537 and 1,159 in previous year. Ninety-three major and 171 minor operations were made as against 63 and 134 last year. One hundred and fifty-three castrations were done by Burdizzo's method against 123 in previous year. All the animals of Central Farm, Dairy, Breeding Stations and of the Government Agricultural Chemist were tested for Johne's disease and tuberculosis by the double intra-dermal method with negative results.

Sixty-one heads of cattle were protected against rinderpest by the serum-simultaneous method of inoculation.

19. *Farm Labourers' School.*—The number of part-time labour pupils in the morning and evening classes was one and nil respectively in the year. Besides, there were 19 day scholars attending the school. The total strength was thus 20.

20. *Essential services*—(i) *Electrification.*—The portion of Lawley Road from the western end of the estate to the eastern limit of the Research Institute was electrified. Electric installation was also provided for the Principal's bungalow. Government have deferred the electrification of all the other remaining buildings.

(ii) *Gas plant.*—There was a phenomenal rise in the quantity of gas manufactured and used during the year, 580,700 cubic feet being used against a total of 454,000 cubic feet in the previous year—an increase of 28 per cent.

(iii) *Water-supply.*—Owing to the continued failure of the monsoons the estate water-supply had to be further curtailed. The average quantity pumped daily decreased from 71,400 gallons in 1936–37 to 63,000 gallons in 1937–38. This restricted supply causes great inconvenience to residents north of the Lawley Road. Government have recently decided that the proposals for supply of Siruvani water to the Agricultural College and Research Institute and the Forest College should be dropped and other sources of supply are being investigated.

(iv) *Activated sludge plant.*—This continued to work satisfactorily, the sullage and effluent being used for irrigation.

21. *Health.*—The general health of the estate was good. Towards the latter part of the year chicken pox was prevalent, the total number of cases being 42.

Twenty-four births and eight deaths were recorded in the year.

22. *Workshops.*—A large number of departmental orders were executed. The Falkamesam plant continued to be worked.

23. *Works.*—The following works were executed departmentally during the year.

	RS.
Public Works Department grant—	
Original—	
New clerks' quarters	2,923
Repairs—	
Residential buildings	9,887
Departmental grant—	
Minor works and repairs to roads and buildings (non-residential) (72 items).	11,992
	24,802

24. *Dairy*—(i) *Dairy Herd.*—The herd was 41 strong at the beginning of the year. There were 14 births; 11 cows were received from Hosur; 8 animals from Government Agricultural Chemist; 14 animals were sold; 21 animals were transferred to Hosur; 3 animals died. The total thus at the end of the year was 36.

Bulls served 38 farm cows and 5 cows of the Government Agricultural Chemist.

(ii) *Milk yield.*—Particulars of herd strength, milk yield, etc., are as below :—

Number of cows in the herd	27·9
Number of cows in milk	20·6
Number of cows dry	7·3
Percentage of cows in milk	73·8
	LB.
Total milk yield	106,623·5
Average yield per day	292·2
Average yield per cow in milk per day ..	14·2
Average yield per cow over all in the herd ..	10·5

The total yield of 106,623·5 lb. of milk together with 4,234·5 lb. of outside milk purchased and slight excesses brought to account totalling in all. to 110,909·25 lb. was distributed as below :—

	LB.
Sold as whole milk	83,840·50
Fed to calves	8,122·50
Colostrum, exhibition, etc.	1,279·75
Separated	17,666·50
	110,909·25

Out of 17,666 lb. 8 oz., of milk separated (against 22,098 lb. in last year), 1,812 lb., 14 oz., of cream was obtained. 1,773 lb., 11 oz. was churned producing 996 lb., 7 oz. of butter. Of the total quantity of 1,006 lb., 3 oz. butter made 937 lb. were sold as such, 20 lb., 7 oz. were converted into ghee, 43 lb., 14 oz. were issued for milking and 5 oz. were issued for exhibition, leaving a closing balance of 4 lb. 9 oz. in stock at the end of the year.

(iii) *Poultry.*—The flock was 135 strong at the beginning of the year. Eleven birds were received from Government Agricultural Chemist, 291 chicks hatched out, 157 birds were sold, 38 died, one was transferred to Government Agricultural Chemist. The flock at the end of the year was 241 as detailed hereunder.

Pullets	35
Hens	65
Cockerels	34
Cocks	5
Chicks	102
	241

(iv) *Eggs.*—8,944 eggs were handled during the year as detailed below :—

Sold for hatching	1,323
Sold for table	6,959
Incubated	486
Fed to stock	157
Exhibition, etc.	19
	8,944

Eggs are being graded and trap nesting continued.

25. *Central farm*—(i) *Season.*—The season was on the whole not favourable during the year under report. Both the south-west and north-east monsoons were late and insufficient adversely affecting the crops. The total precipitation during the year was 21·1 inches, the average for the last thirty years being 25″.

(ii) *Crops—Paddy.*—The season was not favourable. The drought during the growing period and shortage of water in the channel in September-October adversely affected the crop. The average yield was 3,374 lb. of grain per acre against 4,046 lb. in the previous year.

Sugarcane.—As mentioned in the previous two years, the same ten varieties were tried this year. The average yield was 43·8 tons per acre. Co. 413 again gave the highest yield.

Cotton.—The area under Cambodia cotton was 19·46 acres. The season was on the whole favourable for cotton. Due to continuous drought in the later stage of the crop bolls finished bursting earlier than usual. A fair average acre yield of 1,041 lb. kappas was obtained.

The area under dry cottons (1936–37) was 34·16 acres, the average acre yield being 426 lb. kappas. Strain 2,622 again yielded better than the other strains.

Sorghum.—Irrigated summer cholam occupied 16·04 acres, the average yield being 1,893 lb. grain per acre. The area under rainfed Periamanjal cholam was 37·98 acres. The yield was very poor due to adverse seasonal conditions.

Ragi.—This crop occupied 22·06 acres, E.C. 593 being the strain grown. The average acre yield was 2,295 lb. grain.

Pulse.—Bengalgram occupied 30 acres, the average acre yield being 206 lb.

Soya beans.—Ten varieties were under comparative trial. Four varieties were grown for fodder. About 56 varieties in all continue to be under trial. The season was unfavourable for soya beans.

Fodder crops.—The varieties grown are given below and the average yield is noted against each.

	PER ACRE. LB.
Cholam	22,622
Maize	19,387
Lucerne	14,319
Guinea grass	63,586
Elephant grass	120,782

(iii) *Orchard and vegetable area.*—Fifteen budded Malta orange plants from Lyllpur, 11 mango grafts and 4 budded orange plants from Kodur were received and planted in the orchard. The receipts from this area amounted to :—

	RS.	A.	P.
Fruits	217	4	4
Flowers	43	14	5
Seedlings, cuttings, etc.	18	10	6
Vegetables	449	4	8

(iv) *Botanic garden.*—The work continued as in previous years. Rupees 115–2–2 was the amount realized by sales of flowers, plants, fruits, etc.

(v) *Cattle.*—The condition of animals remained good throughout the year.

26. *Herbarium*—(i) *Economic.*—A survey of bananas was made in the district of Nellore and in the Province of Coorg. A new variety of banana "Raja Bale" having almost similar morphological characters of Chakkarakeli, but differing from it mainly in the colour of the rind of the fruit remaining green even when ripe was for the first time collected from Virarajendrapet, Coorg, and has been added to the collections here. Character study of five local varieties of bananas was made. The demand for banana suckers continued to be high and 362 suckers representing the several varieties were supplied to various correspondents.

The four varieties of bananas received from Honolulu, Hawaii, are all thriving well. The "Apple" variety has proved to be the Kapur of this Presidency. The Kaio and the Hai are excellent vegetable varieties and are even better than nendran for making fritters (crisps), though the ripe fruits of these are inferior to those of the Malabar nendran. The fourth "Bluefield" is the world famous "Gros Michel" which is in bunch now.

Fodder grasses and Forage plants.—The indigenous fodder grasses grown in 2½-cent plots both under irrigated and non-irrigated conditions were harvested. Under irrigated conditions *Chionachne semiteres*, Fischer. (*Polytoca semiteres*, Benth) gave the highest yield of 14,840 lb. per acre, while as non-irrigated, *Chionachne Koenigii*, Thw. (*Polytoca barbata*, stapf.) gave 8,880 lb. per acre. It is interesting to note that the very best fodder grass in the Kollegal grazing division, viz., *Sehima nervosum*, Stapf. (Kan. Nalai Hullu), a hill grass has established well in the plains at Coimbatore and has given a good yield of 11,040 lb. per acre.

Fairly large quantities of the seeds of all the above indigenous fodder grasses have been collected to meet the demands. A survey was made of the grass flora of the Kollegal Forest division at the instance of the Chief Conservator of Forests, Madras, and a report dealing on the characteristics and fodder value of the different grasses and suggestions for the improvement of the grazing areas was prepared and sent.

Economic enquiries on 167 medicinal plants, weeds and forage plants, hedge plants, English and vernacular equivalents, etc., from 53 correspondents were attended to.

(ii) *Systematic.*—Eight hundred and seventy botanical specimens were identified during the year of which 193 were for the herbarium and the rest for various correspondents. Six hundred and eleven specimens comprising the collections made in districts of Coimbatore, Cuddapah, Kollegal, Nellore, etc., were incorporated into the herbarium.

27. *Visitors.*—The distinguished visitors to the Agricultural College and Research Institute were—

(i) Mr. Percy Kent Norris, Agricultural Commissioner, United States of America.

(ii) Mr. F. W. Andrews, Plant Pathologist, Sudan Agricultural Service.

(iii) Mr. G. M. Henry, Assistant in Systematic Entomology, Colombo Museum.

(iv) Students of Ramakrishna Vidyalaya, Rural Service Centre, Perianaickanpalaiyam.

(v) Students of Rural Service Summer School, Ramanathapuram.

(vi) Sri V. Madhava Raja of Kollengode.

(vii) The Princess of Baroda.

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(viii) Sri P. Ramanathan, Advocate and Honorary Visitor of the Agricultural College.

(ix) Sri Diwan Bahadur S. E. Ranganathan, Vice-Chancellor, University of Madras.

(x) Dr. La Pelley, Entomologist, Government of Kenya.

(xi) His Excellency Lord Erskine, Governor of Madras.

(xii) Her Excellency Lady Marjorie Erskine.

(xiii) D. H. Elwin, Esq., Private Secretary to the Governor of Madras.

(xiv) P. T. Saunders, Esq., Director of Veterinary Services, Madras.

(xv) The Hon'ble Sri C. Rajagopalachariar, Prime Minister, Madras.

(xvi) Apte, Esq., Director of Agriculture, Gwalior.

(xvii) Dr. Taskhir Ahmad, Assistant Entomologist, Imperial Agricultural Research, New Delhi.

(xviii) The Hon'ble Sri V. I. Muniswami Pillai, Minister for Agriculture and Rural Development.

(xix) Sri N. S. Varadachariar, Parliamentary Secretary to the Minister for Agriculture and Rural Development.

(xx) A. G. Beattie, Esq., Agricultural Officer, Nigeria.

(xxi) A. B. H. Koorshid Sahib Bahadur, Economic Botanist to His Exalted Highness the Nizam's Government, Hyderabad.

(xxii) Sir Arthur Hill, Director of the Royal Botanic Gardens, Kew.

(xxiii) Dr. J. D. Tothill, Director of Agriculture, Uganda.

(xxiv) Dr. G. W. Crowther, Department of Soil Chemistry, Rothamstead.

(xxv) Dr. F. Crowther, Plant Physiologist from Egypt and Sudan.

(xxvi) Professor R. Rugglesgates of the London University.

(xxvii) Sri Bapineedu, Parliamentary Secretary to the Hon'ble Minister for Administration Reports and Public Information.

COIMBATORE,
1st *May* 1938.

R. C. BROADFOOT,
Principal.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, I CIRCLE, VIZAGAPATAM, FOR THE YEAR 1937–38.

I.—CHARGE.

I was in charge of the circle throughout the year. Sri Rao Sahib G. Jogiraju was in charge of the Vizagapatam division till the 23rd of December 1937, when he went on leave for nine months. From this date, I was in additional charge of this division till the 3rd January when Sri V. N. Subbana Charya took over and continued to be in charge till the end of the year. Sri M. V. Raghava Rao was in charge of the Rajahmundry division throughout the year except for a fortnight when I held charge of this division.

II.—AGRICULTURAL EDUCATION.

2. *Farm Labourers' School, Anakapalle.*—The school for the juvenile labourers at the Agricultural Research Station, Anakapalle, continued to work during the year. There were 24 boys on the rolls during the year.

3. *Practical training in agriculture.*—During the year the Government sanctioned the entertainment of educated youngmen at each Agricultural Research Station, with a stipend of Rs. 15 per month for each candidate to undergo a short course of training in practical agriculture for a period of four months. The response under this scheme was rather poor and only four candidates at Anakapalle and Gudiyattam took advantage of the facilities given and attended the course.

III.—DEMONSTRATION.

4. *Season.*—The rainfall received during the summer months of February to June was much in excess of the normal for this period. The heavy rains in the months of February and April accompanied by strong winds were largely responsible for lodging of sugarcane crop under harvest, rendering the yield and quality of jaggery poor. This was, however, beneficial for the standing crops of young sugarcane, gingelly, ragi, chillies and plantain. Though the south-west monsoon broke out in time, the rainfall was below the average and unevenly distributed. It was seriously in defect throughout the Vizagapatam district affecting adversely the punasa or early cropping. Combined with this, the delay in the receipt of water to the canals in the Godavari delta retarded the progress of transplanting of paddy. The transplanting of paddy was considerably delayed in the Vizagapatam district for want of sufficient rains. It was commenced mostly in September and continued till the 15th of October in some places.

The north-east monsoon set in early but was feeble throughout. It came to a close by the last week of October and there was practically no rain till the end of the year. The rainfall during this season was much below the average for the period. Owing to the failure of rains from November, most of the irrigation sources have dried up in the Vizagapatam district and the paddy crop suffered considerably and consequently the yield of paddy was very poor. As there was practically no rain at the time of flowering in the Godavari delta bumper yields of paddy were obtained this year. Dry crops in general suffered throughout the circle for want of adequate rains and in consequence gingelly, ragi and groundnut gave poor yields. The season was favourable for paddy and sugarcane except in the Vizagapatam district for paddy and unfavourable for other crops.

A. Crops.

(*a*) Paddy.

5. Paddy is the important cereal of the circle. The main cultural improvements advocated in paddy are reduction in seed rate, transplanting of paddy with two or three seedlings, early and efficient tillage of seed-beds and adequate manuring.

6. *Cultural improvement.*—Fairly good progress has been made in regard to the reduction of seed rate. The area of seed-beds sown with reduced seed rate was 28,514 acres as against 27,772 acres in the last year and the seedlings obtained from this area were transplanted in twos and threes in an area of 316,401 acres as against 285,443 acres in the prveious year. Early and efficient tillage of seed-beds with improved ploughs is advocated as usual and the area brought under this improvement in the Vizagapatam district is 13,661 acres.

7. *Methods of manuring.*—The use of green manure for paddy occupied a prominent place in the extension work of the department. The area of paddy crop green manured in the Vizagapatam district shows a rapid progress compared with that of last year while there is some decrease in the area in the Godavari division. The total area of paddy crop manured during the year is estimated at 62,971 acres against 48,909 acres of last year. The area treated with phosphatic manures is 717 acres.

8. *Multiplication and distribution of paddy seed.*—Paddy strains from Samalkot, Maruteru and Anakapalle Research Stations continued to be popular with the ryots. As it was not possible to meet the full demands of the ryots, seed-farms are organized every year for the multiplication of seed under the supervision of the department. The fresh seed available from the research stations is mostly supplied every year to the seed-farm ryots with a view to maintain the purity of the strains and the ryots are directed to obtain their requirements from them. Through the agency of these seed-farm ryots large quantities of good seed are made available to the ryots every year.

The quantity of paddy seed of improved strains obtained from the Agricultural Research Stations and supplied to the ryots is 1,166 cwt. sufficient to plant about 6,200 acres. The quantity of seed made available through the seed-farms is 28,027 cwt. The total area in the circle under the departmental strains of paddy including the natural spread is estimated to be 330,969 acres as against 307,030 acres in the previous year. The area under seed-farms arranged in the year under report is 4,881 acres from which a quantity of about 2,338 tons is expected to be available to the ryots for the next year's sowing.

9. *Other cereals—Ragi.*—Ragi strains Nos. 525 and 355 evolved at the agricultural Research Station, Anakapalle, are popular in the Vizagapatam district and 1,421 acres were grown under them. No. 525 has ben found to be suitable for both early and late seasons. These two strains did not find favour with the ryots in the Godavari division.

Ganti.—One hundred and forty-six acres were under Punjab and Poona varieties of ganti as against 170 acres of last year.

(*b*) Sugarcane.

10. *Varieties.*—J. 247, Purple Mauritius and Co. 213 are the varieties that continue to be grown largely in this circle. The area under J. 247 has decreased from 11,061 acres to 10,286. Co. 213 also is becoming popular particularly in the Vizagapatam district and its cultivation is on the increase. The area under this crop is 8,282 acres as against 7,305 acres in the previous year. Varieties like Co. 281, Co. 313, Co. 419 and P.O.J. 2878 are also gaining popularity in parts of the circle and there are 578 acres under these varieties. Purple Mauritius is the variety which is largely grown in the Godavari delta with the exception of 3,547 acres grown with other varieties. Total area under all the improved varieties of sugarcane in the circle is 19,146 acres.

11. *Seed and cultural improvement.*—A quantity of 124,375 setts of departmental seed material equivalent to 20,000 whole canes was supplied to the ryots. In the Vizagapatam district an area of 75 acres as against 106 acres in the previous year was planted for short crop of sugarcane for multiplication and distribution of vigorous seed material. The reduction in the area was due to the unfavourable weather conditions and the practice of using shoots from the early harvested crop. Sixteen lakhs four hundred and twenty-five thousand setts sufficient for 1,095 acres were made available from seed raised as short crop. The area under short crop is only 5 acres in Godavari division. Line planting of sugarcane with wider spacing was done over an area of 8,068 acres through the efforts of the department while the area brought under this improvements by natural spread is 6,112 acres in the Vizagapatam district.

Inter-cultivation with bullock power is slowly gaining ground in this district as a result of persistent propaganda made with a view to reduce the cost of cultivation of sugarcane. The area inter-cultivated in this manner is 2,527 acres during the year.

12. *Introduction of roller mills and jaggery manufacture.*—The construction of improved furnaces were continued as before and 743 Godavari and 27 Sindewahe furnaces were constructed during the year. One hundred and fifteen improved mills were introduced. The reduction in the number is mainly due to the large supply of mills effected in the previous year and to some extent to the increased consumption of sugarcane by sugar factories. One thousand nine hundred and seventy-one demonstrations on the preparation of good jaggery were conducted during the year. Of these, 56 relate to the demonstration of making cream jaggery.

(*c*) Fodder.

13. Efforts were made as usual to persuade ryots to grow fodder crops like pillipesara, sunnhemp and kolakuttai grass to supplement their paddy straw. During the year 920 lb. of seed was supplied.

(*d*) Fruits.

14. Advice on the selection of fruit trees, their correct method of planting, pruning and manuring and control of pests and diseases are the chief activities attended to. The cultivation of plantain received a great impetus in the Vizagapatam district and its area has increased from 576 acres in the previous year to 1,151. The total area of plantain grown according to the improved methods is 2,849. The railway concession granted for plantain was availed by the exporters to a greater extent than in the previous year. Other fruit plants such as mango, citrus, grapes and pine-apple were planted in an area of 1,175 acres under departmental advice.

(*e*) Oil seeds.

15. Groundnut is very extensively grown in the Vizagapatam district. The main improvement aimed at is the closer spacing in the matter of sowing. During the year 17,376 acres were sown in every furrow instead of the local practice of sowing in alternate furrows as against 12,409 acres in the previous year. Groundnut strains A.H. 25 and A.H. 45 were introduced in an area of 110 acres.

(*f*) Fibre crops.

16. The quantity of cambodia cotton seed distributed during the year is 338 lb. This is being tried for the first time as an irrigated crop in the Bhadrachalam taluk and progress of crop is satisfactory. The results are awaited. Under rainfed condition it has not done well.

B. Implements.

17. The number of demonstrations conducted with different ploughs during the year is 3,834 as against 2,495 in the previous year. Guntakas were also demonstrated throughout the circle; as many as 713 demonstrations having been held during the year. Nine hundred and fifty-four demonstrations were also held with junior hoe, buck scraper, roll easy mhote wheel, triangular harrow and Archemedian screw, turmeric polishing machine and

sprayers. The total number of improved ploughs purchased by the ryots in the circle is 456. Fifteen ploughs of these relate to the Godavari division. The sale of other implements is given below :—

Junior hoe	4
Guntakas	11
Roll easy mhote wheels	57
Spare parts	150
Pruning implements	24
Chaffcutters	4
Archemedian screw	1
Tobacco markers	3

C. Livestock.

18. The usual propaganda with regard to the improvement of livestock was carried on by the district staff. There are eleven breeding bulls in the circle, of which three are buffalo bulls. The three bulls and one buffalo bull stationed at Anakapalle Agricultural Research Station have performed 146 services during the year. Though donations for breeding bulls to be stationed in the villages numbered twelve, bulls could be supplied only to three donors in the district. Two of them were purchased locally while the third was supplied from the Agricultural Research Station, Anakapalle.

19. *Poultry.*—During the year 582 birds and 578 eggs of improved breeds were supplied to the ryots. The demand for these birds declined in the Vizagapatam on account of great loss of birds sustained in the last year due to diseases.

20. *Bee keeping.*—Bee keeping continued to show good progress and the number of hives maintained in the circle is estimated to be 400. One hundred and five bee hiving and 66 honey extracting demonstrations were conducted. Eighteen bee hives and one honey extractor were supplied to the parties.

D. Manures.

21. (*a*) *Sale and production of green manure seeds.*—The crops recommended for green manuring are daincha, wild indigo, indigo and pillipesara. A quantity of 12,106 lb. of green manure seeds was sold departmentally during the year while the local agencies supplied 384 tons of seed.

(*b*) *Farm yard manure.*—Better methods of preservation of cattle manure to increase its quality and quantity continued to form one of the most important item of propaganda throughout the year. In the Vizagapatam district 2,275 manure pits were newly dug and 35,110 manure pits and heaps were properly covered. The figures under these two items for Godavari division are 887 and 590, respectively. Eighteen thousand one hundred and thirty-six dry earth sheds were maintained for conservation of urine.

The total number of composts made during the year rose from 1,171 to 1,900. In Ellore, 150 composts with nightsoil were made with the co-operation of municipal authorities.

(c) *Artificials.*—The sale of artificial manures is effected by the manure firms through their local agencies. The departmental activities regarding their use are merely advisory.

E. Pests and Diseases.

22. The Act against the red hairy caterpillar pest on groundnut and other dry crops was in force for the second time in the Pundi Uddanam area of the Tekkali taluk. Its provisions were also extended to the Narasannapeta subdivision during the year. The campaign was conducted on similar lines as in the previous year with the special staff engaged for the purpose. In spite of many emergencies of moths during the period due to erratic weather conditions, the pest was effectively checked covering an area of 24,000 acres. As the paddy silver shoot fly has been causing considerable damage to paddy in Chicacole taluk, the trial of control measures were taken up with some study of the pest and its associates. Neem oil, neem cake and crude oil were tried as deterrents. The application of crude oil emulsion alone has given consistently good results.

The chief pests controlled during the year are thrips on chillies, lapphigma on ragi and onions, bark eating caterpillars on citrus, plant lice on tobacco, beans and brinjal, swarming caterpillar in paddy nurseries and sugarcane borers. Sulphur dust treatment against smut on cholam was demonstrated and 2,357 acres were sown with such treated seed as against 1,739 acres in the last year. Mottled disease on citrus was in evidence for the first time in the Vizagapatam district and 280 trees were treated. Other diseases tackled during the year are wilt of betelvine, leaf spot disease on yam, gummosis and foot-rot on citrus, and moss in paddy fields. In the trials laid out for the eradication of the mosses in paddy lands, it was observed once again that the treatment with copper sulphate, though fairly effective, has not destroyed mosses permanently.

F. Demonstration and Trial Plots.

23. *Demonstration plots.*—The several improvements advocated by the department are brought to the notice of the ryots by conducting demonstration plots in their own lands. These demonstrations are chiefly in varietal, cultural and manurial methods of paddy, sugarcane, ragi and groundnut. The total number of these plots laid out during the year is 1,803 as against 1,863 in the last year.

24. *Trial plots.*—During the year 487 trials were conducted on paddy, ragi and sugarcane. Ten paddy strains from Berhampur Research Station were put under trial in the Vizagapatam district. Owing to very unfavourable seasonal conditions conclusive results could not be had in most of the cases. Of the Berhampur strains only Boroponko 238 and Bayahunda 1,615 proved superior to locals and gave increased yields of 25 and 21 per cent respectively. The Anakapalle strains like Sunkisannam 5, Mypali 7, Bangarutheega

9, and 155 were tried with success in the new areas of the district and these gave respectively 20 per cent, 11 per cent, 16 per cent and 9 per cent increased yields over the local varieties.

Ragi strains No. 525 and V.Z.M. 33 gave increased yields ranging from 9·5 to 10·3 per cent when compared with the local. Poona ganti gave 17·9 per cent increase over the local variety. Groundnut A.H. 25 and A.H. 45 have done well in all the places tried and they gave 27 per cent and 12 per cent increase respectively when compared with local varieties.

G. Joint work with the Co-operative department.

25. The Co-operative Loan and Sale Societies at Anakapalle and Bimlipatam were given the necessary help in effecting the sale of jaggery and groundnut. During the year 107,272 maunds jaggery costing Rs. 86,896 were sold through the society at Anakapalle. The Bimlipatam Society which is interested in groundnut disposed of 6,800 bags of groundnut valued at Rs. 37,339. The Sugarcane Growers' Societies at Bobbili, Thummapala, Etikoppaka and Kirlampudi, are the other organizations which co-operated in the development of agricultural improvements. The services of three Agricultural Demonstrators were lent to these societies for developing sugarcane work and introducing early, medium and late maturing varieties of cane, best suited to the localities where sugar factories are located.

H. Agricultural Associations.

26. There are 110 village improvement associations functioning during the year and 418 meetings in all were held in connexion with the development of agriculture, in the villages under the guidance of Agricultural Demonstrators. The Fruit Growers' Association at Vizianagram conducted the Fruit Show during the year.

I. Agricultural Exhibitions and Shows.

27. The Vizagapatam District Annual Exhibition was held this year at Kothavalsa under the auspices of the panchayat board. Besides the Fruit Show held at Vizianagram, four exhibitions on a large scale and 62 small exhibitions were held in connexion with fairs and festivals, health-week celebrations and jamabandi camps. The Motor Exhibition Van toured for three days in the West Godavari district.

J. Lectures.

28. During the year 117 lantern lectures and 359 lectures without lantern were delivered.

K. Publications.

29. The total number of villagers' calendars and bulletins sold during the year is 2,700 and 210, respectively, in addition to the free distribution of leaflets. Besides, 4 books of 'Agricultural Facts and Figures' and 15 pamphlets on bee keeping were sold.

L. Loans.

30. During the year 233 Takkavi loans to the extent of Rs. 2,000–15–0 were granted in the Vizagapatam district for the purchase of 315 ploughs and 137 spares. The total number of ploughs introduced so far in this district with the advent of the Takkavi loans is 2,792.

IV.—Agricultural Research Station, Samalkot.

31. *Season.*—There was a total rainfall of 35·90 inches during the year as against 55·98 inches in the previous year, the averages for the last five and thirty-five years being 37·77 inches and 36·33 inches, respectively. The rainfall was insufficient and ill-distributed. The season was in general favourable for paddy and sugarcane.

32. *Paddy.*—An area of 26·93 acres was planted in the main crop season and an yield of 3,056 lb. of grain per acre was obtained. The second crop paddy of the previous year was harvested and it gave an yield of 970 lb. of grain per acre over an area of 7·02 acres. There were 150 units of paddy strains under study in the first crop season. Harisankar a deep water paddy gave the highest yield of 4,593 lb. of grain per acre among the important varieties grown on bulk scale. In the inter-varietal trials, Punasa Akkullu, 3 gave the highest yield of 4,378 lb. of grain per acre followed by Bikkirisanam. Eleven sets of yield trials were conducted. Konamani 238/1 and Konamani 238/2 of this station and MTU. Kon. 18 of Maruteru were outstanding and gave significantly higher yield of about 14 per cent over the control K. 3-A. Punasa Akkullu 3 gave the highest yield of 5,090 lb. of grain per acre under double transplanting and double spacing. Forty-five pounds of nitrogen in the shape of ammonium sulphate plus 30 lb. P_2O_5 as superphosphate proved to be the best dose for paddy immediately following a heavy crop of sugarcane. From the trial of periodical broadcastings and transplantings, it was noted that broadcasting was better than transplanting up to 15th January and afterwards transplanting proved superior. Among the varieties tried garikasannavari 6 of Samalkot was, in general, better than others. There was general improvement in yields from December to February under both broadcast and transplanted conditions. Of the dry, wet and semi-wet seedlings compared, dry seedlings gave 17·4 per cent and 37 per cent increased yields over wet and semi-wet seedlings respectively; the semi-wet was the lowest in yield but came to maturity a week earlier than dry seedlings.

33. *Sugarcane.*—The crop came up well and recorded an yield of 46·93 tons of cane per acre over an area of 5·26 acres during the season. Thirteen varieties were under detailed study and of these P.O.J. 2878 was the earliest to mature followed by Co. 421 while Co. 422 recorded the maximum sucrose content of 19·47 per cent followed by P.O.J. 2878; but the latter showed signs of deterioration in the month of April, while Co. 404 and Co. 421 showed

improvement. Among the two setts of yield trials Co. 419 and Co. 417 gave the highest yields of 69 tons and 60 tons respectively. Under rainfed conditions, Co. 421 was the best, and recorded 29·4 tons of cane per acre. In the deep trench versus shallow bed planting, Co. 213 and Co. 419 in trenches did not lodge without wrapping and propping while the same varieties in beds had to be wrapped and propped in the usual way. Seedlings raised in the nurseries and planted gave higher yields than planting of setts. Co. 419 registered the heaviest yield of 71·18 tons of cane per acre when treated with 200 lb. nitrogen.

34. *Plantain.*—A number of varieties obtained from the other parts of the Presidency were tried and none of them approached the local white chekkarakeli in taste and flavour and karpura chekkarakeli in yield consistent with quality. Increased doses of nitrogen over ½ lb. of ammonium sulphate either alone or in combination with K_2O or P^2O_5 have not increased the yields of karpura chekkarakeli while higher yields were obtained in the case of white chekkarakeli.

35. *Sannhemp.*—The study of sannhemp fibre was taken up with the subsidy of the Imperial Council of Agricultural Research. A number of varieties were obtained from the other parts of the Presidency and tried for yield. A variety from Thiruthuraipundi gave the highest yield of green stalk. The medium duration varieties were found to give the highest percentage of fibre of good quality. The crop did not respond to any added nitrogen in addition to a basal dressing of 5 tons of farm yard manure. Highest yields of green stalk were obtained when the crop was harvested at the full bloom stage, and retting stalk after drying for three days gave the highest yield of fibre.

36. *Other crops.*—Sixty selections were under study in chillies. An yield trial also was made of a number of local varieties with T. 34, but the crop was badly attacked with thrips. A number of selections were also under study in greengram and the promising ones will be compared next year. Other miscellaneous crops such as gingelly, coriander, green and blackgram, fodder and green manure crops were grown.

37. *Livestock.*—There was an outbreak of anthrax and three work buffaloes died of the disease. Two pairs of young buffaloes were purchased and added on to the stock.

Agricultural Research Station, Anakapalle.

38. *Season and rainfall.*—The rainfall received during the year under review was 40·15″ against 39·4″ the average for the last 25 years. Although the total rainfall was above the average, the distribution was unsatisfactory and in consequence the paddy crop was badly affected.

39. *Experimental crops.*—Sugarcane, paddy and ragi were the crops on which experiments were conducted. Among the sugarcane varieties under comparative study, Co. 419 and Co. 421 have

given the best yields of 53 and 44 tons, respectively of millable cane per acre against 29 tons obtained from J. 247, a variety grown extensively in the locality. These two varieties also fared better than other varieties grown under water-lodged conditions. Co. 508 a promising early variety has given 30 tons of cane per acre. Under rainfed conditions Co. 419 was the best and gave an yield of 30 tons of cane per acre.

Owing to unfavourable season the average acre yield of paddy has fallen to 1,955 lb. Bayyahunda No. 1, a coarse variety gave the highest yield of 2,435 lb. Ten strains of paddy received from Rice Research Station, Berhampore, were tried during the year. These strains did better than the local varieties but further trials are necessary to confirm their superiority. In the paddy green manure experiment conducted for the past 11 years, green manuring gave a significant increase in yield over no manure. In pyru season (January-April) ragi E.C. 593 and V.Z.M. 33 gave an equal yield of 1,283 lb. grain per acre. Ragi B.A.M. 10, in punasa or early season (April-June) gave an yield of 2,576 lb. grain per acre which is significantly greater than that of ragi Nos. 355 and 525. E.C. No. 593 has given the maximum yield of 2,383 lb. grain as a rainfed crop.

40. *General.*—The farm produce sold to ryots as seed is given below :—

Paddy	**25·5 tons.**
Sugarcane	**13·5 ,,**
Ragi	**4,243 lb.**
Cumbu	**1,759 ,,**

Agricultural Research Station, Gudiyattam.

41. *Season and rainfall.*—During the year under review there was a total rainfall of 38·6″ against 33·6″ the average for the past 23 years.

42. *Experimental work.*—Sugarcane was the only crop on which research work was carried out. Among the varieties Co. 408 and Co. 419 gave the maximum yields of 59 and 57 tons of millable cane per acre respectively under normal treatment in the comparative study against 44 tons of J. 247. But in the restricted treatment (less manure and limited irrigation) Co. 213 and Co. 243 gave 38 and 34 tons cane per acre respectively, against 27 tons control—J. 247. In addition several varieties were under observation in the study plots.

43. *Non-experimental crops*—(i) *Paddy.*—Among the long duration strains tried on bulk scale, two types of Co. 3 (hybrids) gave the maximum yield of 3,098 and 2,866 lb. of grain per acre.

Co. 10, strain gave the maximum yield of 3,030 lb. of grain per acre in the bulk trial of short duration strains.

(ii) *Groundnut.*—A.H. 25 strain gave 2,407 lb. of pods per acre against 2,256 lb. given by the local strain.

44. *General.*—The quantity of seed distributed to ryots was as shown below :—

Paddy	**6·5 tons.**
Sugarcane	**11·5 ,,**
Ragi (E.C. 593)	**240 lb.**
Soya bean	**82 ,,**

VIZAGAPATAM,
2nd May 1938.

B. RAMAIAH,
Deputy Director of Agriculture, I Circle.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, II CIRCLE, GUNTUR, FOR THE YEAR 1937–38.

I. —CHARGE.

Sri T. Budhavidheya Rao Nayudu Garu was in charge of the circle from the beginning of the official year till 3rd August 1937 except for a month when Sri A. Gopalakrishnayya Nayudu Garu officiated. I took charge of the circle on 4th August 1937 and continued to be in charge till the end of the official year.

Sri A. Gopalakrishnayya Nayudu Garu was in charge of the Nellore division, as Assistant Director, from the beginning of the official year till 11th September. I was in additional charge of the division during the week following when I handed over charge to Sri V. T. Subbayya Mudaliyar Avargal, who continued to be in office till the 24th March 1938 when Sri S. Narayanayya Garu took charge of the division and continued till the end of the official year.

II. —DEMONSTRATION.

Season.—The year recorded a lower rainfall than the normal in both Kistna and Guntur districts while in the Nellore district it was more than the normal in the southern taluks. Summer rains were helpful in pulling up green manure crops though they were not sufficient for punasa sowings. The south-west monsoon set in rather late resulting in the late transplanting of paddy in wet lands and delayed sowing of ' tolakari ' dry land crops like sajja, groundnut, korra and fodder jonna. Droughty conditions prevailed in September, adversely affecting almost all dry crops and groundnut in particular. The north-east monsoon was rather heavy and slightly prolonged in the Nellore district while in Guntur and Kistna districts it was below normal and distributed over a fewer number of days. The time available for sowing the pyru crops like jonna, cotton, variga, etc., was restricted to a short period. The sudden changes in weather conditions in late September and early October predisposed the tobacco nurseries to " Damping off." For want of sufficient moisture in the soil, due to failure of late rains, groundnut pods could not be completely harvested and a large proportion of the pods remained in the soil. As November and December were practically dry, tobacco crop was much stunted in growth. The season was in general favourable to the punasa crops and unfavourable to those sown in the ' pyru season.' The characteristic cyclonic weather of north-east monsoon was not experienced during the year.

2. *Crops*—(*a*) *Cereals*—(i) *Paddy.*—In the Kistna and Guntur districts, Mtu. 7, 8, Atragada 4,717 and Konamani 3,414 are getting extremely popular while G.E.B. 24 and other selections from

Coimbatore are being favoured in a few places. For the second crop Garikasannavari 925 is being preferred. For multiplication of pure seed in the circle, 562 acres under seed farm conditions and 790 acres with approved seedsmen were arranged. The area under improved strains of paddy was 292,803 acres as against 182,445 acres of last year. The estimated area under green manures for paddy lands is 10,845 acres as against 11,452 acres of last year. Of the several crops grown for the purpose Pillipesara seems to be the best.

(ii) *Jonna.*—There is no strain in cholam of approved merit under wide distribution in the circle. T-6 came up well at Atmakur and Guntur while at Nellore and Kovvur it was a failure. Some of the selections evolved at the Agricultural Research Station, Guntur are still in the trial stage. There was practically no smut on the crop during the year. Ryots have realized the utility of treating cholam seed with sulphur dust against smut and 2,064 sulphur dust packets were sold in the circle during the year.

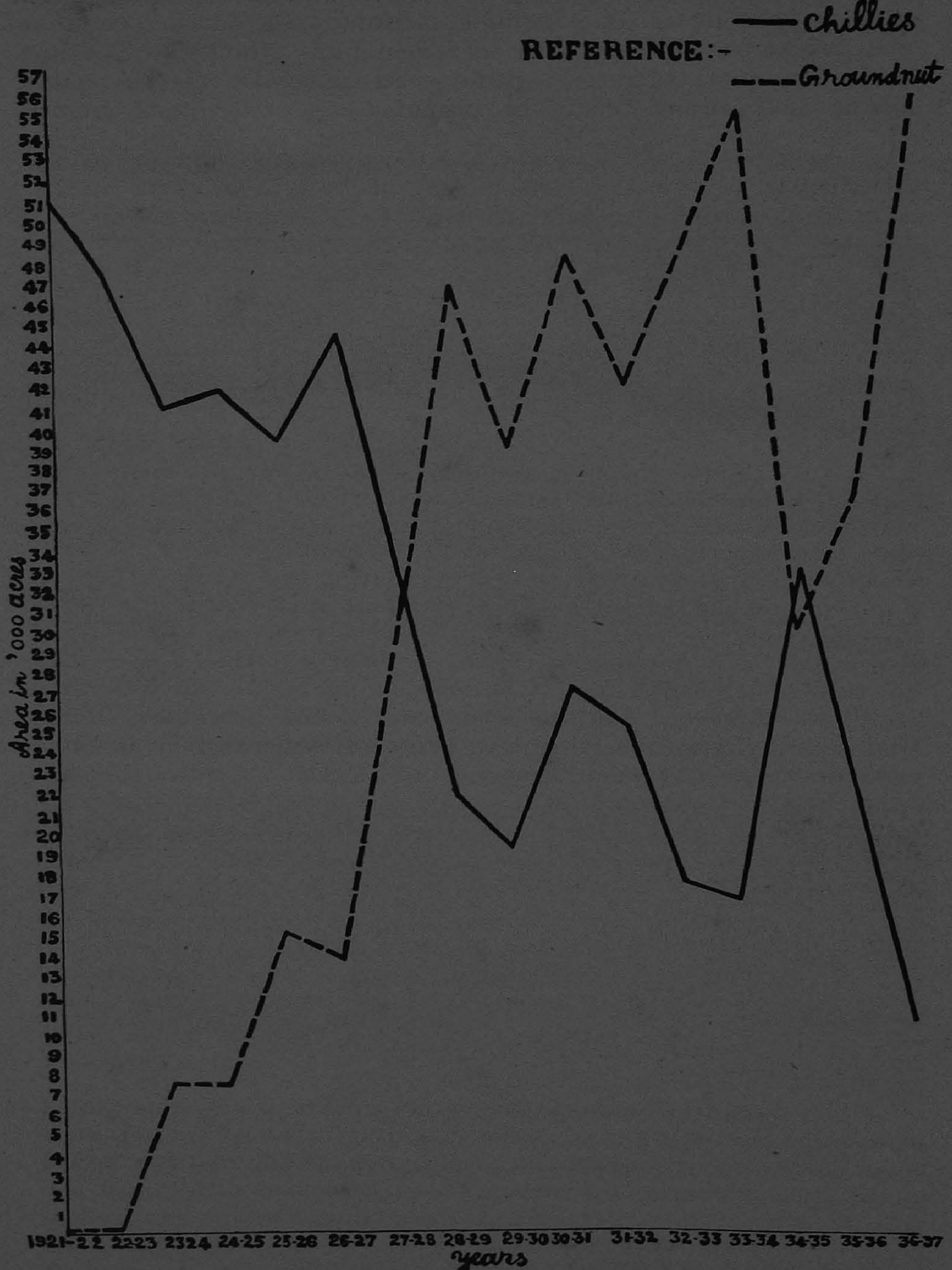
(iii) *Korra.*—Korra selections Nos. 9 and 10 of the Agricultural Research Station, Guntur, were tried at Atmakur, Gurzala and Vinukonda. The results though inconsistent seem to warrant their trial for another season.

(iv) *Ragi.*—At Kandukur and in two villages of the Ongole taluk under Gundlakamma project E.C. 593 was tried against the local, but there was no appreciable difference. At Gurzala VZM 8 ragi gave an increased yield of 7 per cent over the local.

(*b*) *Fibres*—(i) *Cotton.*—Cambodia cotton has been under trial in this circle for a fairly long time. If sown early it is found to come up well in soils fairly retentive. Due to seasonal variations, its yields are somewhat erratic. Besides it is rather difficult to find a ready market for the produce. The area under this crop is therefore not increased to any appreciable extent. Cambodia selection No. 1742 gave about 10 per cent increased yields over Co. 2 at Nandigama during the year. Cocanadas 171 and X20 were found better yielding (by about 10 per cent) than the local at both Kandukur and Gurazala. Strains No. 43 and X20 at Nandigama gave 16 per cent and 39 per cent more yield respectively than the local (Cocanadas). There is a general tendency on the part of the ryots to cultivate all suitable dry land area with groundnut and tobacco than cotton.

(ii) *Gogu.*—Patwa gogu (Pusa) raised in the punasa season came up very well in most of the places. It is liked for its vigorous erect and non-branching habit, fibre qualities and edible nature of leaf.

(*c*). *Fodders.*—T-6 and T-12 jonnas were tried again for fodder this year in the circle. Though these are slightly longer in duration, as they are more leafy with sweet stalk, cattle relish them better. In normal seasons better yields are obtained from these than local. There is a tendency for a general rise in the



Graph showing the rise in area under groundnut and the fall in the area under chillies.

area under Pillipesara in both wet and dry lands of the circle and it occupied about 22,000 acres. In the Bezwada tract there seems to be a general tendency to take a fodder crop of sunn-hemp or pyru jonna after the removal of groundnut. Small areas have been put under kollakattai grass in pastures and guinea grass, lucerne and maize for fodder purposes.

(*d*) *Fruits.*—Work under this head mainly consisted in the introduction of new varieties of fruit plants, advice on the method of planting, pruning, manuring, irrigation and control of pests and diseases. The department supplied to the ryots about 14,123 plantain suckers, 2,192 grafts of mangoes, 60 of guavas, 628 of sapotas, 2,317 of citrus, 3,197 seed coconuts, 1,990 coconut seedlings, 75 papaya seedlings, 200 pineapple suckers, 26 vegetable cuttings and tubers, 80 grape vine cuttings, 150 rose cuttings, 1,800 bamboo seedlings, 50 jasmine cuttings and others 9,178 plants. Trench system of irrigation was introduced in 6,711 trees and 4,105 trees were pruned. Bordeaux paste was applied to 4,105 plants for gummosis. Three hundred and fifty acres of gardens were inter-cultivated with improved implements.

(*e*) *Oil seeds.*—43,092 lb. of A.H. 45 and 7,502 lb. of A.H. 25 groundnut pods were distributed during the year. There is a general feeling amongst the ryots from this year's experience that in years when late rains fail, short duration varieties of groundnut are preferable. A.H. 45 is about a fortnight later than the local bunch and it had to be lifted much before the pods were completely ripe, for fear the soil would get too hard for lifting. Under normal conditions the two strains are noted to give an extra yield worth Rs. 4–8–0 per acre.

(*f*) *Spices—Chillies.*—A number of selections evolved at the Agricultural Research Station, Guntur, were under trial in the circle during the year. Most of them have done well in the typical dry land areas recording yields of 10 to 35 per cent in excess of the local. Of these Nos. 393 and 399 seem to catch the ryot most. These selections are observed to be more tolerant to thrips attack. With the introduction and increase of area under groundnut, an alternative host plant for chilli thrips, chilli crop began to suffer very badly from the pest with the result that the area under chillies gradually declined as brought out in the graph on page 24.

(*g*) *Sugarcane.*—Sugarcane is not grown in any appreciable scale in the Nellore district. Purple mauritius is the only variety that is commonly grown in parts of Tenali, Repalle and Bapatla taluks of the Guntur district. There has been a considerable rise in the area under sugarcane in the Kistna delta since the Vuyyur Factory began to function. In the Factory Zone Co. 243 is at present the leading cane. Co. 419 and P.O.J. 2878 seem to be gaining popularity. Co. 421, 313 and 281 are still under trial though the thicker type of canes are preferred to Co. 243, in view of their heavy tonnage under well manured conditions, richer juice and

better recovery, omission of propping and wrapping and heavy nature of the loamy soil in which they are grown necessitate the restriction of the manurial dosage to keep the crop standing, more particularly the tall top-heavy thick canes. Under the latter conditions probably Co. 243 may prove the best. Intensive propaganda in regard to varieties, methods of cultivation and manuring is being done in the factory zone and three Demonstrators were specially posted for three months during the harvest and planting season.

An area of about 50 acres was put under short crop under lift irrigation to serve as seed material.

(*h*) *Drugs and narcotics*—(i) *Tobacco.*—There was a considerable increase in area under the crop during the year and nearly 70 per cent of it under Virginia. It has attracted the ryots so much that every bit of suitable dry land was cropped with it. As there was considerable failure in the nurseries, price of seedlings went up to Rs. 20 for seedlings enough for transplanting an acre and in many places late planting had to be undertaken for dearth of seedlings in the proper time. The crop was poor to start with for want of sufficient moisture in the soil after planting, but the timely setting in of the "Pyru gali," it pulled up and the colour developed was in general quite satisfactory. The prices ranged from Rs. 350 to Rs. 380 per candy of 500 lb. at the commencement of the season, but as the season advanced and late planted crop came into the market, it went down to as low as Rs. 50 per candy for ungraded bulk. The late planted crop failed to develop good colour and in consequence had to be sun cured as the price it would fetch may not cover the cost of flue curing.

There was an area of 6,185 acres under H.S. Nos. 8 and 9. Uniformity of growth, size and colour of leaf contributed to an increased profit of Rs. 20 to Rs. 25 per acre by the cultivation of these strains compared to the control. It was, however, reported that H.S. No. 9 did not fare well in the higher lankas of Bezwada sub-circle.

Growing nurseries on raised seed-beds with periodical spraying to ward off "Damping off" was demonstrated in several places. Control of 'Orobanche' by periodical removal was one of the important items of propaganda on the crop.

(ii) *Ginger.*—There was an area of about 12 acres under ginger cultivated under departmental advice in Masulipatam, Challapalli, Guntur and Atmakur sub-circles and it is likely to extend further next year.

(*i*) *Miscellaneous crops.*—The following quantities of seeds and seedlings of new crops were supplied departmentally or otherwise during the year. Soya beans 76 lb., senna seed 4 lb., gingelly 10 lb., summer sajja 29 lb., teosente 24 lb., onions seed 17 lb. davanam seed 6 lb., potatoes 24 lb., bamboo seedlings 1,800, English vegetables and tomatoes, cutting of chrysanthemums, jasmines, roses, korukapalli seed, etc.

Davanam came up well and is likely to extend in cultivation. Of the English vegetables tomatoes consistently fared the best. There is an increase in demand for korukapalli seed for live fence.

3. *Implements and tools.*—One thousand six hundred and forty-seven demonstrations with improved implements in ryots' lands were conducted during the year and the sales through depots and departmental agency are as follows :—

Improved iron ploughs ..	93	as against	122	last year.
Do. interculti ators ..	49	,,	26	,,
Roll Easy Mhote Wheels ..	35	,,	31	,,
Sprayers	3	,,	1	,,
Garden implements and tools	25	,,	17	,,
Spare parts	52	,,	116	,,
Chaff cutters	Nil	,,	2	,,
Water lifts	29	,,	17	,,
Bee-hive sets	7	,,	18	,,
Buckscraper	1	,,	Nil	,,
Miscellaneous other implements	12	,,	Nil	,,

4. *Manures—Farm-yard-manure.*—Proper conservation and storage of farm-yard-manure was one of the main items of work attended to during the year. The following were the improvements effected in this direction :—

Dry earth and trench system	1,247	as against	1,444	last year.
Manure pits and heaps ..	2,962	,,	2,114	,,
Providing sheds over manure pits and heaps	17	,,	29	,,
Composts	18	,,	Nil	,,
Manufacture of poudrette ..	2	,,	Nil	,,

Attempts are being made to encourage preparation of good manure out of organic waste by composting all rubbish.

Green manures.—This item of propaganda is being pursued as usual in spite of practical difficulties as a result of seasonal vicissitudes. The following are the quantities of seed distributed during the year departmentally or otherwise :—

	LB
Dhaincha seed	5,204
Pillipesara seed	6,800
Indigo seed	49,055
Vempali seed	74,659
Sunnhemp seed	14,940
Total ..	150,658
	or 67 tons

as against 36 tons of last year.

Of all these, Pillipesara is getting popular in almost all heavy wet land areas; besides being grown as a pure crop or mixed with cholam in dry lands.

Concentrated manure.—The following quantities of concentrated manures were used for the different crops in the circle during the year :—

	CWT.
Commercial fertilizers	29,658
Oil cakes	115,948
Bone-meal	650

5. *Pests and diseases.*—There is a general awakening among the public that plant diseases and insect pests can be controlled. Departmental officers were very often requisitioned for, to check diseases on several crops and plants. The most important diseases tackled during the year by the district staff and by the Entomology Assistant were the following :—

Gummosis, collar rot and die back in citrus; thrips on chillies; aphids and prodenia on tobacco; leaf spot on turmeric; smut on cholam; blast, mealy bug and gall fly in paddy; control of minor insect pests on vegetables and fruit plants; "Damping off" in tobacco nurseries.

Pest Act.—Water Hyacinth found in Atkur tank limits of Nuzvid taluk was removed under Pest Act.

6. *Trial plots.*—There were in all 21 trial plots, six in paddy, three in cotton, eight in jonna and four in korra.

Paddy.—Adt. 11 and A.E.B. 65 were compared with molakolukulu and Adt. 11 fared the best. Co. 2 and Co. 7 were compared with Iswarakora, a coarse red riced variety, and Co. 2 stood first with fine white rice.

Hybrids 10783 and 10905 were tried at Tumur of the Gudur taluk against the local Vadan Samba. Local gave the best yield. Co. 2, Co. 3, Co. 5 and Co. 7 were compared with Mosanam in three places under the Gundlakamma project area to find out a variety suitable in the intermediate season. The differences in the yields of the strains are not very appreciable though all of them fared better than the control. Vankisannam 3268, 3269 and Mtu. 8 were compared in Bezwada sub-circle and the differences in their yields are not significant.

Jonna.—Trials were conducted with J. 75, 91 and 103 against local jonna in Repalle, Guntur, Ongole, Vinukonda, Gurzala, Bezwada and Nandigama. Excepting those at Bezwada and Nandigama, the trials did not show any conclusive results, as the crop in general was very poor and did not set grain due to continuous drought after sowing. At Bezwada Nos. 75 and 103 gave about 20 per cent more yield than the local, while at Nandigama J. 103 was on par with and the others much below the local in yield.

Korra.—K. 9 and K. 10 were tried with the local at Atmakur, Gurzala, Vinukonda and Nandigama. It was at Vinukonda alone that the strains are noted to yield substantially higher than the local.

Cotton.—Two trial plots were laid out with 171 and X 20 at Gurzala. The results are not significant. X 43 and X 20 at Nandigama gave 16 per cent and 39 per cent more than local. There were 73 observation plots with new strains of various crops and those most promising will be carried forward to be tried in the trial plots.

7. *Demonstration plots.*—Demonstrations were conducted in ryots' lands on improved methods of cultivation, growing of new and improved crops, trial of improved implements, manures and methods of insect and fungoidal control, to demonstrate the superiority over the local agricultural practices. The total number of such demonstration plots were 798 as against 744 of last year.

8. *Co-operative work.*—The usual co-operative work with other departments like holding agricultural exhibitions during health weeks, investigating and advising the Public Works Department from an agricultural point of view in regard to new irrigation projects, conducting crop cutting experiments with the Revenue department was pursued during the year. Help was also sought from other departments whenever such help was considered necessary in the interests of the departmental work.

9. *Exhibitions and shows.*—Forty-one Agricultural Exhibitions and shows as against 27 of last year were held during festivals, jamabandi camps, health week celebrations, etc. Fifty-five illustrated lectures and 109 ordinary were delivered on important occasions as against 26 and 74, respectively of last year. The Motor Exhibition Vans went round ten taluks accompanied by a Demonstrator specially appointed for the purpose.

10. *Improvement of livestock.*—There were 14 breeding bulls under the premium scheme and three maintained by private bodies. Sixty-four birds and 578 eggs of improved breeds of poultry were supplied to the ryots. There were 126 pigglings of Berkshire and Poland-China crosses in the circle.

11. *Loans.*—The following are the particulars of loans sanctioned for the purchase of the various agricultural implements for the ryots :—

	NO.	RS.	A.	P.
Water lifts. (Kifayat Rahat) ..	8	2,385	0	0
Ploughs with spare parts ..	14	71	8	0
Buck scrapers	1	11	0	0
H.M. Guntakas with spare blades and Pruning sets	7	88	0	0
Archemedian screws	1	25	0	0
Mhote wheels	15	177	12	0
Sprayers	2	50	0	0
Cultivators	1	25	0	0
Total ..		2,833	4	0

12. *Publications.*—Departmental publications (leaflets) were freely distributed to interested ryots. One thousand one hundred and sixty-eight villagers' calendars and 90 priced publications were sold during the year.

III.—Agricultural Research Stations.

Rice-sub-station, Buchireddipalem, Nellore district.—Selection work was started in most of the important paddy varieties of the tract, viz., molakolukulu, atragada, vadan samba, sannavari and peeshanam, suitable for the early, intermediate and late seasons. Thirty-five strains and varieties from other stations were under comparative trials during the year. An area of 50 cents of dry land adjacent to the station has been taken on lease for the construction of cattle-shed, threshing floors, etc.

Works.—Wire fencing and construction of cattle-sheds and threshing floors were completed during the year.

Agricultural Research Station, Lam, Guntur district—(a) Crops.—In Jonna 362 units were under preliminary study and 20 under comparative trials. Of these J. 103 and 106 were found to be distinctly superior than the local jonna. Results of " Fodder grading experiment " and " Top and bulk seed trial " were not significant. In the seed rate experiment initiated this year seed rates 9 and 12 lb. per acre seem to be suitable. Korra K-6, maize X 4, sajja 151 and 192 are the most promising amongst those under study in them.

Selection work in cotton (Cocanadas) continued on the same lines as before and a fresh batch of 300 was selected during the year. A number of promising selections made in previous years are in different stages of study and comparison. Of the several Cambodia strains No. 920 was the best closely followed by 1742.

Adcock No. 13 and Harrison Special No. 9 were the most promising types in cigar and cigarette tobacco selections evolved at the station. In the local Narrow, No. 20 was consistently the best in all the three years. Of the economic crosses made between local and exotic types, Nos. 3, 7 and 10 maintained their high grade of quality throughout in flue curing.

One hundred and twenty fresh selections were made in chillies during the year. Twenty-six selections were under preliminary yield trials of which six were most promising. Of the six selections, in the final stage of comparison none proved better than No. 390 a selection already under distribution.

Economic study was continued on gogu, red-gram, Bengal-gram, soya beans, wheat, elephant yam, patwa gogu (pusa) gave better yields and better quality fibre than the local. In soya beans laredo thrived the best. Elephant foot yam is likely to come up well under dry conditions. Agronomical problems as rotation of crops, green manuring, single versus double crop, continued to be under study. Results of the green manure experiments indicate that tender crops like cowpea in conjunction with an optimum dose

of super is beneficial to any succeeding cereal. Experience in the demonstration plots laid out during the year confirmed this fact. Cultural work in spacing and mixed cropping was continued. No conclusive results could be obtained in the spacing experiment. Cotton with groundnut gave the best monetary return in the mixed cropping trials.

(*b*) *Implements.*—Bar point iron plough supplied by the Research Engineer for trial was found to be too small for efficient working in the stiff soil. A new type of wooden rake with 12 tynes devised was found to be efficient for the removal of stubbles and preparatory cultivation.

(*c*) *Livestock.*—Out of 14·7 cows in the Ongole herd 8·4 cows were in milk on the average and the daily average yield per cow was 8·6 lb. as against 12·0 lb. of last year. Most of the animals calved for the first time, hence the low yield. 4·7 Delhi buffaloes were in milk on the average during the year, out of a total herd of 6·2 and the daily average per animal was 16·5 lb. as against 20·3 lb. of last year. The best of the Ongoles gave 5,237 lb., of milk with a lactation period of 365 days and a daily average of 14·4 lb. The best buffalo gave 8,172 lb. of milk in 393 days with a daily average of 20·8 lb.

Sheep.—The two ewes and one ram received last year from Hosur gave birth to 2 ewe and 2 ram lambs, bringing up the herd to 7.

(*d*) *Side lines.*—Rhode island reds were the only pure exotic breed maintained at the station. One hundred and fifty-five birds and 210 eggs (for hatching) were sold during the year. Attempts are being made for grading up the local breed with the Rhode island blood. The bee-hive maintained in the station gave 5¼ lb. of honey as against 7 lb. last year.

(*e*) *General.*—Of the four students posted for practical training in agriculture, three joined and had the training for the specified period.

Purchase of 7·13 acres of red soil area sanctioned in G.O. Ms. No. 1438, dated 24th August 1936 for fruit growing was taken possession of on 24th November 1937 and the whole block was fenced all round.

GUNTUR, Y. G. KRISHNA RAO,
30*th April* 1938. *Deputy Director of Agriculture, II Circle, Guntur.*

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, III CIRCLE, BELLARY, FOR THE YEAR 1937–38.

I.—Charge.

A. C. Edmonds, Esq., B.A., was in charge of the Circle from the beginning of the year, except for 22 days from 30th June 1937 when Mr. R. Swami Rao, Assistant Director of Agriculture, Kurnool, held additional charge. When the latter officer was on leave on two occasions, for a month from 14th May and for 19 days from 21st September, Mr. A. Ramaswami Ayyar, Assistant Director of Agriculture, Bellary, was in additional charge of the Kurnool division. During the absence of Mr. C. Vijayaraghavan as Officiating Millets Specialist, Mr. P. Krishna Rao was Superintendent, Dry Farming Station, Hagari, from 28th June to 30th October. Mr. K. C. Naik continued to be Superintendent, Fruit Research Station, Kodur, except for 12 days when Mr. A. C. Edmonds was in additional charge. Mr. P. Subrahmanyam, Assistant in Millets, was in charge of the Agricultural Research Station, Nandyal, during a month's leave of the permanent Farm Manager Mr. K. Rama Rao from 21st May and continued as such from 3rd January when the latter was transferred for district work.

II.—District Work.

2. *Season.*—The average rainfall in the districts was 17·27″ against annual average of 22·85″ in Bellary, 23·51″ against 22·62″ in Anantapur; 23·73″ against 21·39″ in Kurnool and 26·67″ against 26·62″ in Cuddapah. In major portions of Bellary district and in the northern taluks of Anantapur district the season was a thorough failure necessitating the opening of famine relief camps and fodder depots by Government. The absence of useful rains from the middle of October onwards during the setting period of mungari (early sown) crops and during the best growing period of the most important hingari (late sown) crops, viz., cotton and jonna was mainly responsible for the above situation. In Kurnool division conditions were a little better. There was a very pronounced cold wave towards the end of November and this appears to have been responsible for the very good yields of jonna and cotton reported from some taluks of Kurnool district especially those in the Nandyal valley. Famine relief works and fodder depots were, however, opened in portions of the western taluks of Kurnool district where crop failures were reported.

A. Education.

3. Short courses in practical agriculture initiated by Government last year were continued. In the stipendiary course two students were trained at the Fruit Research Station, Kodur, and

four at the Agricultural Research Station, Nandyal. The course lasted for four months from 15th November 1937 to 14th March 1938. The number trained in the non-stipendiary course at the Agricultural Research Station, Nandyal, and at the Fruit Research Station were 3 and 12 respectively. The courses are becoming popular. There is more demand for training in horticulture but the lack of boarding and lodging facilities in the neighbourhood of the station at Kodur appears to stand in the way.

B. Crops.

(*a*) Jonna.

4. In Bellary division 5,677 lb. of improved strains of jonna were sold against 2,750 lb. in the previous year. This is a distinct improvement. The most popular strain was T-1 jonna (white), the area under natural spread being 162,200 acres. In Kurnool division, 29/68 (yellow) continued to be the popular strain, the quantity of seed of improved strains sold being 5,104 lb. against 4,172 lb. in the previous year. Thirty thousand four hundred and thirty acres are reported to have been grown with these improved strains. Seed farms have been arranged for the most popular strains.

(*b*) Paddy varieties.

5. G.E.B. 24 maintained its popularity. The quantity of seed distributed in Kurnool division was 6,215 lb. against 2,783 lb. of last year. It is estimated that this crop was grown over 21,925 acres in the circle. Other popular strains were Co. 2, Co. 7, Co. 10, Adt. 3 and Bangarakhaddi.

6. *Seed distribution.*—Seed farms have been raised to meet the demand for seed. But some ryots seem to favour the importation of fresh seed from research stations once in five years at least.

7. *Cultural improvements.*—Work in this line consisted in raising thin paddy nurseries and adopting economic transplanting. Nearly 19,840 acres were under such improvements in this circle.

8. *Manuring.*—In spite of the unfavourable season the area sown to green manure was 14,577 acres as compared with 12,705 acres in the previous year.

(*c*) Cotton.

(i) '*Westerns.*'

9. As in the past H-1 has been under distribution. Of 204,179 lb. distributed, 165,557 lb. were sold and the balance issued for sowing in seed farms in 2,979 acres in six villages. The natural spread area was 200,700 acres. This work was confined to Bellary division. Owing to adverse seasonal conditions, the estimated increase in terms of cash resulting by growing this cotton may be put at Re. 1 per acre. Assuming only 50 per cent

of the produce is sold at this enhanced rate a sum of Rs. 1,11,350 will be the annual profits for the ryots. This improvement alone is enough to cover the annual budget of the entire circle.

(ii) '*Northerns.*'

10. N-14 has been the chief strain under distribution. The quantity of seed distributed was 23,174 lb. The seed farm area was 189·90 acres. The area under natural spread is reported to be 4,368 acres. This cotton has been fetching a premium of Rs. 30 for the last three years per candy of 500 lb. lint over the prevailing price for "white northerns." Messrs. Binny & Co., Ltd., has been responsible for making this strain again popular by offering the above premium.

(iii) *Cambodia.*

11. Three thousand four hundred and sixty-five pounds of Co. 2 Cambodia cotton seed was sold against 2,600 lb. in the previous year. The area under natural spread was 1,690 acres. The area favourable for growing this crop is very limited and the progress in its improvement must be naturally slow.

(*d*) Sugarcane.

12. As in the past, work has been concentrated on the propagation and supply of superior varieties. In Bellary division 24,000 setts were sold, the most popular being Co. 290, occupying an area of 2,654 acres. This variety is reported to stand ratooning and it is mostly grown in the Factory area at Hospet, because it fetches a premium of Re. 1 per ton over local Pundia cane.

13. Cultural improvements of sugarcane consisted in recommending wider spacing, top-sett planting and early planting of setts to reduce the cost of seed and planting charges. The area under these improvements were 502·57 acres in Bellary division.

14. *Manufacture of jaggery.*—One hundred and seventy-two Sindwahe furnaces were constructed and 49 jaggery demonstrations were held. It is worthy to note that good jaggery was made at Kampli—a place where jaggery never used to set before properly. It was discovered that the local pans and the local method of boiling were more responsible for the bad Jaggery produced, than the quality of the local canes. That the ryots are convinced of this may be gauged by the distribution by the Agricultural Department of 15 flat bottomed pans. Two crushers were purchased by Government and loaned to ryots for 44 days to mill the introduced thick rinded improved cane varieties, and these fetched a hire of Rs. 44. In Kurnool division the Sindwahe furnace was used for boiling turmeric also as in the last year.

(*e*) Miscellaneous crops.

15. Improved strains of ragi, korra and groundnut are becoming increasingly popular. E.C. 593 ragi has been very popular in the circle, nearly 90 per cent of the area in Gundreddipalle village in Kurnool district having been cropped with this strain.

Korra strains 132 and 140 were popular in Kurnool division and K-23 in Bellary division. Two thousand five hundred and forty-two pounds of A.H. 25 groundnut seeds were sold. This strain has done well uniformly in all places. Three thousand three hundred and sixty pounds seed has been obtained from Pollachi to meet the demand for seed in Kurnool division.

Soya beans have shown promise of success both under dry and irrigated conditions. The use of these beans must be properly demonstrated to make them popular.

(*f*) Fruits.

16. As in the past, advice was given for the proper maintenance of existing gardens and for starting new plantations. Correct methods of manuring, irrigating and pruning and combating diseases and pests were fully driven home by actual demonstrations. The sales below indicate increased interest of ryots in horticulture. Orange and lime plants 831; Coconut seed nuts 1,039; seedlings 28; plantain suckers 26; dabba 133; pala 200; mango grafts 751; pomegranates 59. Fifteen thousand casuarina seedlings were sold. These were planted to supply fuel and to serve as wind-break to prevent sand drifting into spring channels and fields from river beds. One hundred and seventy-five pounds of cashew-nuts also were sold.

(*g*) Vegetables.

17. In the interests of better nutrition every effort is being made to grow vegetables, chiefly tomatoes. Messrs. Pocha & Sons supplied free packets of vegetable seeds for trial by ryots and our thanks are due to them. One ryot who grew cabbage with the above seeds, got a silver medal for the best cabbage weighing 10 lb. exhibited at Mahanandi Show. Elephant yam and colocasia and growing of maize in turmeric fields were introduced in Cuddapah. One hundred and seventy-seven setts of tapioca were distributed.

C. Implements.

18. The total number of demonstrations with improved ploughs, harrows, buck-scrapers, bunding implements, chaff cutters, rahats, mhote wheels, mhote buckets, sugarcane mills, sprayers and pruning instruments were 1,359 against 1,629 in the previous year.

19. The number of ploughs sold during the year were 173. These consisted of 71 monsoon ploughs (entirely in Kurnool division), 34 cooper No. 11; 24 cooper No. 25; 19 cooper No. 28 and others. Five hundred and nine spare parts were sold for the above. Other sales included 18 H.M. Guntakas No. 2 and 5 bullock rahats.

D. Manures.

20. *Sale of green manure seed.*—The total quantity of green manure seeds sold or transferred from Government depots amounted to 27,129 lb. as compared with 31,505 lb. in the previous

year. This includes large sales of 8,416 lb. Sunnhemp, 1,193 lb. Daincha and 5,229 lb. Pillipesara effected in Kurnool division along with 10,596 lb. of Nandyal indigo seeds supplied outside the division to other circles.

21. *Conservation of Farm Yard Manure.*—This was effected by the maintenance of 3,073 manure pits, 18 loose boxes, 29 dry-earth sheds and 3 byre-pits.

22. *Manufacture of compost.*—Two hundred and ninety-eight compost pits were maintained during the year. Special mention should be made of the work done at Hospet and at Proddatur in making compost out of municipal rubbish using night soil as starter. Five hundred cart-loads were made and sold at 4 annas per cart-load in Hospet Municipality. In Proddatur Municipality the stuff prepared from April to December 1937 fetched Rs. 1,620 while the income budgeted was only Rs. 500. There was thus a clear gain of Rs. 1,120. The work is therefore being continued. The above method of making compost gives not only extra income but also leads to the sanitary condition of the rubbish dumping grounds. It is therefore held worthy of being copied by all municipalities.

E. Insect Pest Control.

23. Six hundred and sixty-nine Fungii sulphus packets were sold in Kurnool division for treatment against smut on cholam. Insect pests and fungoid pests on cultivated crops were receiving attention as occasion demanded. The special assistant on this work attended to 34 calls. The most important work in dealing with pests is the combating of " mottled leaf " disease otherwise known as " Frenching " in oranges in Rajampet taluk. A special staff is employed. Treatment consisted in spraying the trees with a wash composed of zinc sulphate and lime in the proportion of 2 : 1 mixed in 200 lb. of water. Eleven thousand three hundred and seventy-two trees were sprayed against 937 of last year. The receipts during the year from spraying were Rs. 222–14–6 by the sale of zinc-sulphate and Rs. 43–8–0 by hire on sprayers. Some of the gardeners have placed orders direct with firms for the supply of 1,232 lb. of zinc sulphate, two 7-gallon sprayers and one 5-gallon sprayer to attend themselves to the treatment and this is enough to bear ample testimony to the efficacy of our demonstration.

F. Demonstration Plots.

24. There were 985 demonstration plots as compared with 707 in the previous year. Interest in these plots is increasing slowly as one of the means of bringing to the notice of cultivators the improvements advocated by the department.

25. The use of bunds, as one of the means of ensuring better crop production in years of deficient rainfall, is slowly gaining ground. In Bellary division 129 plots over an area of 685 acres were bunded. In a famine year like this the demonstrations were of special use as increased yields were obtained from plots bunded early. Jonna in Bevinahalli in Bellary taluk gave 51 per cent

increased yield and groundnuts 62·6 per cent at Guntakal. At Rayadrug cotton yields increased by 87·5 per cent; while Hospet recorded an increase of 60 per cent yield in the case of jonna. A point worthy of note is while there was no crop in the unbunded plots, the bunded plots gave spectacular yields. Six-bund formers were sold in this division.

In Kurnool division there were 46 demonstrations with the bund-former. The increased income per acre over the local in the case of bunded plots at Giddalore varied from Rs. 2–7–1 to Rs. 4–2–0; at Proddatur Rs. 3 and at Cuddapah Rs. 2–8–0. Three bund-formers were sold.

G. Apiculture.

26. No efforts are being spared to encourage apiculture in suitable places. The Assistant in Entomology gave training in apiculture to seven demonstrators. Twenty hives were distributed during the year and 5½ lb. of honey were sold.

H. Joint work with Government Departments.

27. Every opportunity is being utilized to come in contact with members of various other Government departments at conferences and meetings. Even though the District Economic Council does not exist as such its work is being continued at special meetings convened by Collectors once a quarter. One loan and sale society was started at Proddatur. The services of an Agricultural Demonstrator have been placed at the disposal of the Hospet Co-operative Sugarcane Growers' Union. The question of doing agricultural propangada with the help of panchayat boards is likely to prove fruitful.

I. Conferences and Exhibitions.

28. These were intended to advertise the activities of and to bring home to ryots the improvements of our department. There were 30 exhibitions during the year, against 38 in the previous year. Special mention should be made of exhibitions at Gadidhamadugu and at Proddatur, as they were coupled with cattle fairs and held under the auspices of the District Economic Council. Government gave special grants for the above exhibitions. As usual cattle fairs were held at Mahanandhi and at Ahobilom. Government granted a sum of Rs. 60 for the award of prizes in cash for the cattle brought for the show at Mahanandhi. The Hon'ble Mr. V. I. Muniswami Pillai, Minister for Rural Development, distributed prizes at the show at Proddatur and the Hon'ble Mr. V. V. Giri, Minister for Industries, opened the show at Anantapur. In Kurnool during the National Health and Baby Week celebrations, cholam-malt bread and biscuits were exhibited in our stall. A farmers' day was arranged at the Dry Farming Station, Hagari, on 24th January 1938, when thirteen cultivators brought by demonstrators were taken round the station and the useful results explained to them.

The Motor Unit No. 1 toured for three months in the Circle and 49 lantern lectures were delivered in all.

J. Improvement of Livestock.

29. In Kurnool division there were six premium bulls which performed 224 services. The number of calves born were 51. In Bellary division there were five breeding bulls. This work has been transferred to the Veterinary Department from 1st April 1938. Poultry improvement is being brought about by the supply of eggs of Rhode Island Reds and White Leghorns.

K. Loans.

30. The amount distributed in Bellary division was Rs. 1,765 among 10 ryots in Tadpatri and Kadiri taluks for the purchase of four Rahats; three H.M. Guntakas; three Cooper Ploughs No. 11; three of No. 26; one bundformer and one chaff-cutter. In Kurnool division Rs. 40 was distributed for two ryots in Rajampet taluk for the purchase of two Cooper Ploughs No. 11, one Myticutta Tree Prunner, one digging fork and one H.M. Guntaka No. 2.

L. Sale of Publications.

31. One thousand six hundred and twenty-three calendars and fifty-eight bulletins were sold during the year.

III.—Research.

A. District trials—Trials in ryots' lands.

32. These have been in progress during the past three years with a view to test new strains of crops and new cultural practices in comparison with local crops and local methods over a wide range of soil conditions that prevail in this circle. This is only a continuation of research that is in progress in Research Stations.

33. *Cotton.*—There were seven mungari cotton trials and the results will be incorporated in the Cotton Specialist's report. The appointment of a Gazetted Assistant for the improvement of this cotton shows its importance.

34. In the case of hingari cotton there were eight trials in Kurnool division. There was significance in two cases, 1 346,556 and 340 giving higher yields than N-14. In all places N-14, 23 and 29 gave as good yields as locals. In the case of Cambodia cotton trial N-14 gave the highest significant yield.

35. In Bellary division H-1 still reigns supreme as the most popular strain. It is becoming popular in Tadpatri area on account of its high yeilds; but the consumers complain of its poor quality. Trials made to study the effect of environmental factors on the

quality of H-1 lint indicate that Adoni sample was best spinning to 35's. The next best was Guntakal's. Jammalamadugu and Tadpatri samples were poor, spinning to 20's and 18's respectively.

36. *Jonna.*—There were 12 trials in Kurnool division, 5 in cheruku varieties, 5 in bendu and two in fodder varieties. In the first 28/3 gave better yields than local; in the second Nos. 223, 224 and 25/106 and in the last 23/10, 29/82, 124 and 502.

In Bellary division there were seven trials. Five dried up on account of drought. In the remaining two trials J-35 and T-1 gave better grain yields than local.

37. *Korra trials.*—There were 13 trials in Kurnool division. Nos. 132 and 140 gave higher yields than locals. In Bellary division there were five trials of which three failed on account of drought. The results of the trials at Adoni were not significant and in Guntakal no strain was superior to the control.

38. *Cultural experiments.*—Ploughing and bunding trials started two years back at Sanganakallu, Haddinagundu, Bevinahalli and Paramadevanahalli were continued this year. The treatments were least effective in red soils and most effective in shallow black cotton soils. In deeper black soils the effect was less pronounced than in shallow ones. The trials in red soils at Anantapur, Kadiri and Hindupur confirmed the above results.

39. *Manurial trials on oranges.*—These were carried out for three years in six different fields, one at Giddalore, one at Nandyal and four at Rajampet. An equal number of Sathgudi orange trees was chosen for the manurial treatments and usually the following dose of manure was applied per tree—sheep manure 50 lb., bone-meal 5 lb., ammonium sulphate 2 lb., potassium sulphate 2½ lb., and superphosphate 3½ lb. Half the dose was applied at Giddalore. The control trees were manured with cattle manure or sheep manure. The results of application of manure were significant giving 18 per cent increase of fruits over the control mean.

B. Dry Farming Research Station, Hagari.

40. *Season.*—The total rainfall for the year was 15·43″ received on 27 days, while the average for the last 10 years is 20·47″. The rainfall was far below normal and also badly distributed. The season was therefore very unsatisfactory.

41. *Cotton.*—Two hundred and sixty-seven selections were under row-yield trials. Nineteen reputed strains, 15 of the Asiatic group and 4 American types were under yield trials with H-1 as control. None of the above was superior to H-1. H-1 gave the highest yield at Tadpatri also. The average yield of H-1 from the bulks was 173·7 lb. of kapas per acre. In the case of ploughed and bunded plot in F. No. 4 the yield was 235 lb. kapas per acre.

42. *Jonna.*—Several strains of cholam have been under comparison. Among the local types none was superior to T-1. In the

case of Bombay sorghums five strains gave higher grain yields than T-1. The average acre yield of T-1 in the bulk area was 204 lb. grain and 1,234 lb. straw. In a plot in F. No. 6 where there was water stagnation this strain gave 538 lb. of grain per acre. This is an indication to show that jonna yields can be augmented by increasing moisture in the soil.

43. *Korra.*—Setaria comparative trials were a total failure.

44. *Ragi.*—In the comparative trials the same eight strains as last year were sown. The highest yielder was R-42 a mutant from E.C. 593 with an yield of 2,580 lb. grain and 4,208 lb. straw per acre. The next best was E.C. 593 giving 2,340 lb. grain and 4,100 lb. straw per acre. R-42 has "in-curved" earheads and with its good yields may prove more popular than E.C. 593.

45. *Other crops.*—Seed improvement work on wheat, Bengal-gram, safflower and onion is in progress involving both selection work and importation of strains from outside the Presidency.

46. *New crops.*—Among these mention may be made of soya bean. Seven varieties were obtained from Auduturai and sown for seed multiplication. This crop stands a fair chance of success under irrigation. Of the salt-bushes imported from Australia Atriplex nummularium grows better than Atriplex baccatum. Attemps to feed cattle with the leaves of these plants have failed. Kapok is making fairly good growth. There were 11 plants at the beginning of the year and one of them dried up. Each tree gave 25·8 fruits on the average against 15·96 in the previous year.

47. *Plant physiology.*—The study of root systems of sorghum and setaria under varying environmental and seasonal conditions of growth was continued.

48. *Cultural experiments.*—In the bunding experiment sorghum in the bunded plot gave 186 lb. of grain and 960 lb. of straw per acre, representing 464 per cent and 79 per cent increased grain and straw, respectively, over the non-bunded plots. Ploughed and bunded plots were better than merely bunded plots in giving 150 per cent and 24 per cent increased grain and straw, respectively. The results of the same experiment in the case of cotton were not significant.

49. *Molasses experiment.*—Professor Dhar has found out that alkalinity can be ameliorated by the use of molasses. This was tried in G-15. Eight tons of molasses were applied per acre. Sorghum was the crop grown. It showed better growth than the untreated plot giving 669 lb. grain and 2,487 lb. straw—an increase of 110 and 190 per cent respectively over that of control.

50. *Soil crack-filling experiments*—Were started to test the useful results obtained at the Agricultural Research Station, Nandyal. Rainfall was defective and only negative results were produced. The experiments will however be continued.

51. *Livestock.*—A herd of Ongoles was maintained on the station. It was 40 strong at the close of the year comprising of 13 work animals, 15 cows, 4 young bulls, 7 young-stock and one stud. The bull at stud served 17 farm cows. He refused to make with outside cows. Eleven cows were in milk and yielded a total of 17,179 lb. of milk as against 17,692 lb. of last year. Cow No. 12 gave the highest yield of 3,782 lb. of milk during 230 days of lactation. The daily average works out to 16·44 lb.

Poultry.—A beginning has been made to demonstrate improvements in this line on this station. Eighteen eggs of Rhode Island Reds were obtained from the Livestock Research Station, Hosur, and set for hatching. Eleven chicks obtained were in good condition during the year.

C. Fruit Research Station, Kodur.

52. *Season.*—42·73″ of rain was recorded against 33·97″ in the previous year. The season was specially favourable for the set of second crop (Gairangam) oranges.

53. *Propagation of citrus.*—Budding has been found to be the best method of propagation. The presence of wood in Cheeni, orange and acid lime has resulted in 30 per cent higher " take " of buds on Kichili root-stocks than the absence of bud shields of these varieties. Gajanimma has shown a higher " take " of orange buds than Kichili. July and September were found to be the optimum months for budding. Among the rootstocks in use Gajanimma and Jamberi have produced the most vigorous growth.

54. *Propagation of mango.*—Root grafting, double working and budding of mangoes have been found to be feasible under Kodur conditions. August has proved to be the best month for inarching. The progeny of eight different polyembryonic varieties of mangoes located in the West Coast are growing at the station. A beginning has been made in the selection and multiplication of desirable off-season bearing varieties. A " grafting potstand " has been devised to facilitate mango inarching.

55. *Classification and nomenclature.*—The work did not progress much owing to the late appointment of staff. However typical fruits of 29 apparently different varieties of mangoes fruiting in the normal season, 28 varieties of off-season bearing ones and 7 varieties of polyembryonic mangoes and 22 of other fruits were sketched and described.

56. *Canning and dehydration.*—Preliminary experiments on the canning of mango pulp, mango slices, fruit salads, pineapple slices, pineapple juice, pineapple jam have given encouraging results. The pineapple eye-extractor designed at the station was found very useful and a distinct improvement over the local method of removing eyes by using a penknife.

57. *Miscellaneous.*—Eight hundred and twenty budded citrus trees, 503 mango grafts and 193 seedlings and rooted cuttings of miscellaneous fruits were sold during the year. Of these, 14 mango grafts were sent to Australia by the purchaser.

58. The station took part in exhibitions, demonstrating improved horticultural practices and giving practical demonstrations on canning.

D. Agricultural Research Station, Nandyal.

59. *Season.*—The rainfall received during the year was 28·43″ distributed over 61 days against the previous year's record of 23·28″ spread over 72 days.

60. *Cotton.*—Strain No. 2108/8, an indicum selection, has given consistenly higher yields than N-14 and local by 40 per cent and 44 per cent respectively during the past 3 years of its comparative trials. N-14 gave an average yield of 217 lb. of kapas per acre over an area of 6·65 acres.

61. *Jonna.*—No strain in preliminary comparative trials exceeded N-28/3; however, eight strains were significantly superior to the old popular strain T-6. The average yield of jonna for all strains on the farm was 538 lb. grain and 895 lb. straw per acre. Strain No. 28/3 gave the highest yield of 787 lb. grain per acre.

62. *New strains.*—Among the promising new strains mention may be made of Nos. 223, 224 and 25/106. Strain No. 224, a non-sweet type, continues to give good yields as in the past.

63. *Other trials.*—Several strains of the station were grown outside the station in three villages to see how they behave under different soil conditions. 28/3 has proved to be the best cosmopolitan strain.

64. *New crops.*—In addition to Burmese varities of soya bean, four were got from the Agricultural Research Station, Aduturai. An acre-yield of 205 lb. in Burmese and 90 lb. in Kachin were got. Aduturai varieties show promise of success.

65. *Soil crack-filling experiments.*—Groundnut-husk filled plots gave higher yields of jonna by 50 per cent over control. This is consistent with last year's results. It is interesting to record the residual effect of groundnut husk in increasing the yield of cotton by 18 per cent. In the case of sand-filled plots the increase was 21 per cent.

66. *Fodder crops.*—Pillipesalu grown over an area of 2·55 acres gave an acre-yield of 6,221 lb. green stuff. It is being advocated in the black cotton soil tracts to supply green fodder. It is also becoming increasingly popular.

67. *Hedge plants.*—Prosopis juliflora, glyricidæ maculata are promising among the hedge plants tried. It can now be stated without any fear of contradiction that the two above hedge plants are not eaten by goats.

68. *Vegetables.*—A plot of 50 cents was devoted to growing brinjals, tomatoes, chillies and other greens. This gave an income of Rs. 111–6–6 per acre.

69. *Livestock.*—The strength of the herd at the end of the year was 9 work animals, 5 bulls, 5 cows and 4 calves. The bull at stud performed 31 services.

BELLARY,
9th May 1938.

R. SWAMI RAO,
Deputy Director of Agriculture, III Circle.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, IV CIRCLE, FOR THE YEAR 1937–38.

I.—Charge.

I was in charge of the circle throughout the year except for March 1938 when M.R.Ry. K. Raghava Acharya Avargal, Assistant Director of Agriculture, Cuddalore was in additional charge of the circle.

M.R.Ry. R. N. K. Sundaram Avargal was in charge of Cuddalore division till 17th July 1937 and he was succeeded by M.R.Ry. K. Raghava Acharya Avargal. M.R.Ry A. Chinnathambi Pillai Avargal was in charge of Vellore division till 20th August 1937 when he was succeeded by M.R.Ry. K. Avudainayakam Pillai who remained in charge for the rest of the year.

II.—Agricultural Education.

The school at the Palur Agricultural Research Station continued to work satisfactorily throughout the year. In addition to this agricultural instruction on practical lines was also imparted to the boys in eight schools of this circle. I was one of the members of the Committee of Annamalai University who drew up a scheme for the colonization of the educated unemployed. The scheme has since been approved by the Syndicate and will be given effect to in the near future.

III.—Demonstration.

(*a*) *Season.*—The total rainfall during the year was more than the previous two years as can be seen from the statement below :—

	1935–36.	1936–37.	1937–38.
Chingleput	42·68	38·92	55·25
South Arcot	42 91	41·66	51·05
North Arcot	41 52	33·05	48·12
Chittoor	35·58	33·10	33 95

The south-west monsoon was delayed in all the districts and the early rains were too poor and insufficient. However conditions improved later on before the closing of the monsoon. The north-east monsoon rains were very heavy in Chingleput, South Arcot and North Arcot districts and these caused considerable damage to crops and roads. The early planted crops or those at the flowering stage and groundnuts especially suffered on account of these heavy rains. Conditions were not so bad in Chittoor district and the crops there were generally benefited. On account of the heavy rains, the tanks got their full supply and this enabled the ryots to grow large areas under kar and cold weather paddy. As already noted above, the crops in the three districts suffered and therefore the yields of dry gingelly, cumbu, groundnuts and

also of the main dry paddy were poor. The main wet paddy crops and the second crops had normal yields. Prices of food crops more or less remained stationery but the price of groundnuts went down. The prices of sugarcanes were not satisfactory. In Cuddalore division there was a sharp rise in the price of jaggery from January onwards.

(*b*) *Crops and cereals*—(1) *Paddy.*—As in the previous years there was great demand for departmental strains. Ninety four thousand six hundred and seventy-one pounds of paddy seeds were distributed as against 42,544 lb. of the previous year. Cuddalore and Vellore division distributed 66,144 lb. and 28,527 lb. respectively. The total area under important strains including natural spread is estimated at 108,000 acres against 58,554 acres of the previous year. Local Garudan samba No. 43, Aduthurai 9, Kasipichodi and Adt. 12 which did well last year in Cuddalore division in addition to the other important varieties proved successful this year also. Every endeavour will be made to arrange seed farms to increase the seed supply. Two strains of vadan samba early and late are under trial in the circle.

(2) *Economic planting.*—On account of the continuous departmental propaganda and demonstrations, ryots have understood the benefits of economic planting. Only recently counts at random were taken in Cuddalore division and in each clump it was found only 5 seedlings as against 10 to 15 which was the normal about 20, 25 years ago. Thus one can say that about 60 per cent reduction in seed rate has taken place. Other improvements effected in paddy cultivation are use of improved iron ploughs and the raising of green manure crops.

(3) *Cumbu.*—One hundred and forty-two pounds of seeds of P.T. 2,229 were distributed in Vellore division. This variety is gradually becoming popular but not so in Cuddalore division. An Australian Hybrid with ear-heads nearly a yard long was found to do well in Gudiyattam taluk and seeds of this have been distributed for trial in both the divisions. Surangi cumbu was tried in several places in Cuddalore division with varying results.

(4) *Ragi.*—E.C. 593 ragi continues to maintain its popularity in Vellore division where 953 lb. of seeds were distributed during the year. In Cuddalore division the ryots want an earlier variety. The total area under this strain in this circle is 1,060 acres. E.C. 3,030, 3,517 and 3,735 are being tested in trial plots.

(5) *Cholam.*—A.S. 2,095 was tried in Vellore division. It was found to do well in North Arcot but not so in Chittoor. Another strain 1,098 was found satisfactory for grain and fodder in Kallakurichi and Vriddhachalam taluks of Cuddalore division.

(6) *Fibres.*—Co. 2 Cambodia cotton maintained its superiority in the circle. Fifteen thousand four hundred and five pounds of seeds were sold from the depots and another 5,000 lb. by the

South Arcot Co-operative Loan and Sale Society. February-March sowings are becoming more popular and early type of cambodia cotton 4,383 is being tested as a summer crop in the wet lands after paddy. If this proves successful there is great scope for the increase of area under cotton in this circle.

(7) *Fodders.*—As in previous years propaganda was made for growing more of fodder crops for feeding cattle. One thousand four hundred and thirteen pounds of fodder cholam seeds were distributed. Teosinte, guinea grass, elephant grass, lucerne seeds, etc., were also distributed. For the first time trials were started in the Panchayat forest areas in Chingleput district of growing Kolukattai grass. The growth is reported to be fair. Silage was made from groundnut haulms in Kalahasti. The stuff prepared was fair.

(8) *Fruit trees.*—Necessary propaganda regarding growing of fruit trees was continued. Three thousand one hundred and fifty-nine plants of mangoes, oranges, sapotas, pineapples and figs were distributed during the year. One thousand five hundred and thirty coconuts from the Oil Seeds Specialist were alsc sold to the ryots.

(9) *Oil seeds*—(i) *Groundnuts.*—A.H. 25 and A.H. 45 are the important groundnut strains which have done fairly well in this circle. There is a great demand for A.H. 25 seeds. Ten thousand two hundred and sixty-three pounds of seeds of this variety were distributed during the year. Every attempt is being made to increase the area under seed farms and distribute large quantities of seeds of this variety. A.H. 45, a bunch variety is also getting popular. The total area under both these strains is 367 acres.

(ii) *Gingelly.*—S.I. 43, 46 and 89 were distributed for trials. Only S.I. 43 was found better in yield than the local. This variety will be further distributed in demonstration plots.

(10) *Sugarcane.*—The distribution of superior strains of canes suited to several localities was done on a large scale. Over 27 lakhs of setts of Co. 281, P.O.J. 2,878, Co. 419, Co. 421 were distributed. Fiji B is being quickly replaced by Co. 281, and P.O.J. 2,878 as the former is rapidly deteriorating. Both Co. 281 and P.O.J. 2,878 have the additional advantage of ratooning well for a year and this helps to reduce cultivation charges. Two other varieties Co. 419 and Co. 349 are quickly coming to prominence in the Nellikuppam factory area and these are being rapidly multiplied by short cropping. The sugarcane growers society for the Nellikuppam factory area commenced work at the close of the year and has planted about 2½ acres with Co. 419 for short cropping while Co. 349 is being developed by the Nellikuppam factory. The Mailpatti Sugarcane factory did not crush canes this year and this has given a great set back to cane cultivation and development of Coimbatore seedling canes in this area;

with the result that B. 247 is still a popular cane with the cane growers of the locality for jaggery making purposes. The area under departmental canes in the circle is estimated at 10,966 acres.

The following improvements in cane cultivation were demonstrated during the year.

(1) Trenching by the use of iron ploughs like the victory, the chattanooga and the steel ridge plough. One hundred and two demonstrations were done.

(2) Selection of disease free setts for planting.

(3) Collection of trash and conversion into compost.

(4) Improvement in jaggery manufacture.

One hundred and sixty-one sindewahe furnaces were worked during the year and 86 demonstrations were conducted in better methods of jaggery manufacture. Cream jaggery was prepared in 12 places.

(*c*) *Implements.*—Two thousand seven hundred and twenty-eight demonstrations of improved implements were carried out in a large number of villages of this circle. A light seed drill to replace the local paddy seed drill and a turmeric polisher were demonstrated in Chingleput, and South Arcot district with success. As a result of the practical demonstrations 1,841 iron ploughs, 91 miscellaneous implements were distributed to ryots from the depots and by the aid of takkavi loans. The distribution of 2,143 spare parts for ploughs is an indication of the usefulness of these ploughs.

(*d*) *Manures.*—Improvement in manuring was done in four directions—

(i) Preservation of cattle manure was demonstrated by the two important methods of covered pits and dry earth methods. Two thousand and fifty-eight new manure pits with earth covering and 362 dry earth sheds were put up during the year. Attention was also paid to the pits and dry earth sheds previously put up. The total number of manure pits, loose boxes and dry earth sheds properly maintained during the year was 6,258.

(ii) *Composting.*—Demonstrations in the composting of organic matter of various kinds, mostly thrashing floor sweepings, cane trash, groundnut husk, and casuarina droppings were conducted. Two hundred and twelve compost pits were thus made.

(iii) *Green manure.*—Green manuring has come to stay in many parts of this circle while the maintaining of seed supply from local sources is a difficult matter due to seasonal causes. Several merchants deal in green manure seeds but departmental seed even in these places

helps to keep seed pure. In addition to local sale the following quantities of green manure seeds wre distributed departmentally :—

	LB.
Daincha	14,193
Sunnhemp	12,115
Kolinji	5,222
Indigo	10,971
Pillipesara	1,296

Pillipesara is a new introduction in Cuddalore division and is getting popular and it is proposed to arrange for local supply by raising seed farms.

(iv) *Cakes and fertilizers.*—These are recommended for crops like sugarcane and paddy and in the absence of legislation regarding the correct percentage of ingredients in the mixed fertilizers, the department does not advocate any brand but the competition among the manure firms is helping to some extent in keeping down costs.

(e) *Pests and diseases.*—Propaganda and practical demonstrations were carried on against all reported diseases. Swarming caterpillars on paddy, plant lice, thrips, etc., on tobacco, chillies, onions and vegetables, stem bleeding disease on coconuts, die back, mottling diseases on citrus, piricularia and blast on paddy and aphids on citrus were the important diseases and pests against which remedial measures were demonstrated. The equipment of appliances and sprayers to all depots has made it possible for every Agricultural Demonstrator to render immediate help to ryots in checking crop pests to some extent. Thirty-eight pruning demonstrations and 140 spraying demonstrations were conducted during the year.

(f) *Pest Act.*—The Pest Act against hairy caterpillar on groundnuts and other dry crops was in force in South Arcot district (except Cuddalore taluk) and the whole of North Arcot district. The pest appeared in a mild form in the beginning due to adverse weather conditions of the south-west monsoon but there was prolonged emergence till the end of September. A few villages suffered badly but the damage due to the pest cannot be said to be so severe as in the previous year. It is found however to be spreading in Chingleput district.

The Act was in force against the Water Hyacinth in Chingleput and Chidambaram taluks. The pest has not been completely eradicated yet.

(g) *Trial plots.*—Sixty-seven trial plots were laid out on paddy, 7 on sugarcane, 2 on cumbu, 4 on cholam, 2 on tenai, 2 on ragi, and 1 on groundnut. Trials on vadan samba selections taken up newly show some promise while a muthusamba selection newly released for South Arcot district was also found to give better yield than the locals. Sugarcane trials always showed the superiority of the Coimbatore selections to the local.

(*h*) *Demonstration plots.*—Nine hundred demonstration plots were laid out on crops like paddy, sugarcane, groundnut, cotton, gingelly, ragi and other millets. As these are stages next to trial plots, they were mostly successful and they lead to increase in the area of these strains or varieties in the localities concerned. Demonstrations on manuring, cultural practices, drill sowing, pruning and spraying were also done on a large scale and the benefits shown to the ryots.

(*i*) *Joint work with the Co-operative Societies.*—Development of non-credit work through loan and sale societies and the formation of agricultural societies were the important items of work done in co-operation with the Co-operative department. Two demonstrators deputed to work under the Central loan and sale societies, Cuddalore, continued except for the fact that the Agricultural Demonstrator, Cuddalore, went on leave from 15th January 1938 and his place was taken up by the Co-operative Inspector. Agricultural Demonstrator, Vriddhachalam, did special propaganda work to strengthen the Vriddachalam warehouse in addition to his own duties. The following quantities were sold through the warehouses.

	Quantity.		Value.		
	CAN.	LB.	RS.	A.	P.
Vriddhachalam	3,375	421	89,210	12	11
Tirukkoyilur	1,825	81	46,246	1	6

The Central Loan and Sale Society, Cuddalore, stocked and sold Co. 2 cotton and Nandyal indigo seeds to members. New loan and sale societies were formed in four places in Vellore division. The Agricultural Improvement Society in Kalian and the milk supply society at Valarpuram continued to function well. One agricultural improvement society was registered in Ammanur in North Arcot district and an agricultural colonization society was started in Avadi at the close of the year. Necessary help was rendered to the Sugarcane Growers Co-operative Society, Nellikuppam, and technical advice and direction were given to the Agricultural Demonsrator deputed for work under the society.

(*j*) *Joint work with other departments.*—This was done by our attending the meetings of District Economic Councils where advice was rendered and active help given in colonization scheme and growing of fruits, etc.

(*k*) *Agricultural Associations.*—Three agricultural associations were started during the year, two in South Arcot district and one in North Arcot district. The Agricultural Association in Trivellore continued to function and sold Rs. 400 worth of ploughs and seeds to members.

(*l*) *Exhibition and shows.*—Fifty-seven agricultural exhibitions were conducted during the year of which two were held under the auspices of the All-India Khadi and Swadeshi exhibition at Madras and Chidambaram. Three more exhibitions at Cuddalore, Conjeeveram and Tiruvannamalai were the major exhibitions attracting

large crowds, while all the rest were purely local in character. Seven ploughing competitions were held during the year and prizes were given to the best ploughmen. Fifty-two lantern lectures and 72 ordinary lectures were also given.

(*m*) *Motor Exhibition Van, III Unit.*—The van was on tour in this circle for 121 days and visited 125 villages. The van continued to attract wide attention and lectures both lantern and ordinary were given in most of the villages visited.

(*n*) *Improvement of Livestock.*—Forty-two breeding bulls under the premia scheme were maintained by ryots and public bodies during the year. These include the bulls purchased by the Chingleput District Board at the close of the year. Thirteen of these bulls did 524 services for the year. The Agricultural Demonstrators continued to inspect the bulls and gave advice regarding the maintenance of the bulls in proper conditions and the rearing of the calves.

(*o*) *Poultry.*—Propaganda on poultry rearing was continued and 230 eggs and 233 birds were distributed in Cuddalore division. Poultry work in Vellore division is done by the American Arcot Mission who have been granted a subsidy of Rs. 1,000 per annum. The mission has in addition to distribution of eggs and birds organized an egg marketing centre at Katpadi and are doing good business. Work has been started recently at Kalahasti for improving the local breed of poultry by suitable matings and selection and is under an assistant specially deputed for this work.

(*p*) *Bee-keeping.*—Thirty-one bee hives were maintained in the districts and help was given to ryots in hiving wild colonies, supply of hives, and demonstrating extraction of honey.

(*q*) *State loans.*—A sum of Rs. 4,484–8–0 was distributed in the shape of ploughs and other implements under takkavi loans to ryots.

(*r*) *Sale of publications.*—The following publications were distributed during the year :—

Villagers calendar	3,032
Bulletins and others	456

IV.—Miscellaneous.

Demonstrators in Mycology and Entomology—Agricultural Demonstrator, Mycology.—He toured for 201 days and attended to 86 calls from ryots and demonstrators. He conducted 41 spraying demonstrations against various diseases of fruit plants and vegetables and demonstrations of the use of Atlas killer against unwarranted trees. He dealt with the following diseases :—Citrus wither tip, mottle leaf, canker, and scab and gummosis, mango leaf and root diseases, plantain shoot rot, tomato leaf spot, betelvine wilt, cashewnut leaf spot, rose and grapevine mildews, coconut bleeding disease, sugarcane smut and also leaf eating and sucking

insects on citrus. He also attended some of the important agricultural exhibitions and helped the Agricultural Demonstrators. He examined some of the tamarind consignments sent from the Madras harbour to Egypt and sent samples of each consignment to the Government Mycologist, Coimbatore, for the issue of certificates.

Assistant Agricultural Demonstrator in Entomology toured for 207 days in the year. He attended to remedial and control measures on spodoptera in paddy in Chingleput, South Arcot and North Arcot districts and also against the hairy caterpillar on groundnut and dry crops in the same three districts. He also dealt with the following other major pests, viz., nephantis, mango hopper, cane fly and epilachna beetles.

Minor pests on vegetables, fruit trees, ragi seedlings, cockchaffer beetles on root crops, semi-looper on castor, prodenia and agathi weevil and soorai on paddy received his attention. He was also in charge of bee-keeping work in and around Madras. He hived 40 wild colonies and sold 22 colonies to applicants. He conducted 19 demonstrations in giving super and 15 demonstrations in honey extraction. He organized a honey week celebration at Saidapet and also attended to other agricultural exhibitions conducted by the demonstrators. He was also engaged along with Agricultural Demonstrator, Mycology, in the examination of consignments of tamarind exported from Madras to Egypt.

Agricultural Research Station, Palur.

A rainfall of 52·02 inches was received as against the average of 50·34 inches for the last 30 years. The south-west monsoon rains started poorly and late and were on the whole insufficient while the north-east monsoon which followed recorded heavier fall than the average causing unprecedented heavy floods damaging all dry crops.

Paddy.—15·57 acres were under paddy of which 11·26 acres were green manured with daincha. This green manure did not do quite well and gave only about 9,000 lb. per acre due to adverse seasonal conditions. The average yield of paddy was 2,959 lb. per acre as against 3,053 lb. of the previous year. The reduction in yield is due to the low yield of second crop paddies which were affected badly by the heavy floods of the north-east monsoon. The first crop paddies gave 17·94 per cent increase and the main samba paddy also gave 11·94 per cent increased yield over the average of the last ten years. Selection work on paddy was continued.

Sugarcane.—8·75 acres were under sugarcane and another 1·25 acres were short cropped. The average yield was 33·86 tons against 32·63 tons of the previous year. Varietal tests were continued in wet and garden lands and it was found that Co. 419 gave the highest tonnage in the dry lands while Co. 421 gave the best yield in wet lands followed closely by Co. 419. Co. 363 was found to be a very promising variety with a good habit giving good jaggery. Trials of seedling canes did not reveal any variety as being better than

Co. 419. In spacing trials it was found that three feet spacing between rows was the most economical for both Fiji B and Co. 281 confirming previous results. Trashing of canes was found to reduce lodging and checks the spread of pyrilla. Seasonal planting trials showed that the best season for planting to get maximum tonnage was from February to April. It was found that under local conditions, reduction in irrigation resulted in a loss of three times the value of the water saved. The economics of short cropping was worked and it was found that cane setts can be produced at Re. 0–15–8 per 1,000 setts.

Other crops.—*Cumbu* was raised in 3 acres and gave on the average 747 lb. per acre due to adverse weather conditions. E.C. 593 ragi was found to be poorer than the local ragi in yield while a trial of kulla ragi with E.C. 3030 showed that the latter gave 13·91 per cent increase over the local.

A.H. 25 groundnut inter-sown in Kulla ragi gave an acre yield of 3,328 lb., which is a very good yield. Gingelly varieties sown in December in 1·50 acres gave an acre yield of 452½ lb. Cambodia cotton did not do well when sown in September.

Fodder.—2·85 acres of cholam and 0·25 acres of teosinte were sown for fodder and they gave 22,902 and 18,400 lb., respectively, per acre. Teosinte was 15 days earlier than fodder cholam. Guinea grass newly planted gave 32,800 lb. while the old plot of Elephant grass gave 50,100 lb. per acre. Berseem and shaftal were tried in different seasons and November sowings gave 12,700 lb. per acre in 2 cuttings which may be said to be fairly satisfactory.

Side lines to farming.—The work consisted of poultry rearing, apiculture and pisciculture. Three thousand five hundred and twenty-two eggs, 12½ lb. of honey and a number of fishes were produced on the farm.

Cattle.—Six and a half pairs of cattle were maintained for work purposes and two bulls were kept at stud for outside services. Seventy services were done during the year.

Exhibitions.—The farm supplied several exhibits to important exhibitions including the Swadeshi exhibition at Madras.

Practical training.—Ten educated young men were given training in practical farming. Two young men were deputed from Pudukotta Darbar and are undergoing training.

Building.—The following new works and repairs were executed :—

	RS.	A.	P.
Cement channel	229	13	9
Threshing floor	356	8	6
Laying drainage pipes	176	2	6
Improvements to manure and store room	578	11	2

Seed distribution.—The following quantities of seeds were distributed from the station :—

	LB.
Paddy seeds	55,976
Groundnut seeds	4,969
Kaki jonna	137
Ragi	1,212½
Cumbu	77½
Tenai	75
Gingelly	310
	NO.
Surgarcane	121,310
Grass slips	19,500

Visitors.—There were 640 visitors to the station.

Finance.—The total expenditure of the farm was Rs. 11,469–8–5 while the receipts amounted to Rs. 4,834–7–10 excluding the value of seed supplied to District Work officers.

The Agricultural School Farm, Kalahasti.

There was a total rainfall of 41·88 inches as against 38·92 inches of last year. The season may be said to be normal except that the north-east monsoon rains were better than usual.

Wet lands.—Vadan samba selections were grown in 4 acres, G.E.B. 24 paddy under semi dry conditions in 3 acres and Co. 2 paddy in 2·10 acres. The following statement shows the yield :—

Field.	Area.	Variety grown.	Yield per acre. Grain.	Yield per acre. Straw.
	ACS.		LB.	LB.
1–4	4·00	Vadan samba	1,900	2,460
5–7	3·00	G.E.B. 24 semi dry ..	1,980	2,400
8–11	1·90	Co. 2 paddy	1,750	2,230
7 outs	0·20	Do.	450	650
		Average yield of the farm ..	1,860	2,350

The average yield is 1,860 lb. as against 1,762 lb. of last year. Due to good late rains 2 acres have been sown with Nallavadu to be irrigated from the water available in the tank.

Dry lands.—6·55 acres of dry lands were sown with groundnut followed by horsegram. A.H. 25 gave 1,760 lb. pods per acre while A.H. 45 gave only 1,220 lb. Horsegram gave 195 lb. grain per acre.

Garden land—Sugarcane.—Four varieties Co. 419, Co. 417, Co. 281 and P.O.J. 2878 were grown in 1 acre. Co. 417 and Co. 419 were found best in tonnage and in jaggery while P.O.J. 2878 was good in tonnage only.

Groundnut.—A.H. 25 and 45 were grown and they gave 1,310 and 1,012 lb., respectively. Cumbu was sown in 1 acre and gave 925 lb. of grain per acre, mostly as a dry crop. Gingelly gave 510 lb. per acre.

Livestock.—Three pairs were maintained and they worked on the average for 210 days. They were protected against rinderpest.

Practical training.—Five students were taken up for practical training of whom three completed the same satisfactorily.

New works.—A Persian wheel was fitted up to the well at a cost of Rs. 400. Coolie lines were repaired at a cost of Rs. 52 and a parapet wall to the Persian wheel was put up at a cost of Rs. 25.

Finance.—The following statement shows the financial conditions :—

	RS.
Finance—	
Expenditure for working expenses	1,400
Expenditure for fitting Persian wheel ...	440
	1,840
Receipts—	
Receipts as cash sales	1,107
Seeds supplied to Agricultural Demonstrators at 30 lb. per rupee	133
Twenty-five thousand sugarcane setts supplied at Rs. 2 per 1,000	50
	1,290
Value of surplus stock over last year ...	103
	1,393

Omitting the expenditure in the Persian wheel newly fitted the working of the farm does not show much financial loss. It is expected that the farm will pay quite well next year.

ST. THOMAS' MOUNT,
10*th May* 1938.

S. U. KHAN,
Deputy Director of Agriculture,
IV Circle.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, V CIRCLE, TRICHINOPOLY, FOR THE YEAR 1937–38.

I.—CHARGE.

Sri Rao Bahadur N. S. Kulandaiswami Pillai was in charge of the circle till 9th November 1937 and on his retirement from service from that date, I took charge of the circle and continued up to the close of the year.

During a short period of seven days from 9th to 15th November 1937, Sri M. Anandan, Superintendent, Agricultural Research Station, Aduturai, held charge of the circle.

Sri P. S. Manian continued to be in charge of the Tanjore district, except the Cauvery-Mettur Project area, throughout the year.

II.—DEMONSTRATIONS.

1. *Season.*—There was a total rainfall of 40·86 inches in Trichinopoly district and 48·83 inches in Tanjore district as against the average of 32·40 and 44·90 inches respectively.

The rainfall received during the summer months of February to May was much in excess of the average for the period. This rainfall benefitted the standing green manure and sugarcane crops. The south-west monsoon rains were normal and well distributed in Trichinopoly district, while in Tanjore district the rains were below normal. Though regular monsoon commenced only from the middle of August, water was let in the Cauvery by the middle of June, thus enabling the planting of kuruvai and raising of samba nurseries in time.

The north-east monsoon rains were slightly above normal and mostly precipitated in October-November. The dry crops of cumbu and cotton were adversely affected by these continuous rains. The kuruvai harvest was interfered with and the young plants of samba crop were spoiled necessitating re-planting. The rains of December-January were poor, and affected the dry crops of cotton. The cold weather rains of February were above average and interfered with the harvest of samba paddy, the proper germination of green manure seeds, and reduced the yield of pulses.

The season has therefore not been on the whole favourable for dry and wet crops due to uneven distribution of rains.

2. *Crops*—(*a*) *Cereals*—(i) *Paddy.*—This forms the main food crop of the circle and occupies 14 lakhs of acres. Following are the lines of improvements advocated and adopted by the ryots :—

(*a*) *Multiplication and distribution of strains.*—Nearly 50 per cent of the total wet area is occupied by strains. Seedsmen and other corporate bodies multiply and distribute the strains under the guidance of the department.

During the year 152,185 lb. of paddy seeds were distributed departmentally and 826,795 lb. by ryot-seedsmen and corporate bodies. The approximate area cropped by departmental strains is 668,017 acres.

(b) *Thin sown nurseries and economic planting.*—This improvement has become nearly a general practice throughout the tract. It is only a question of time when the optimum seed-rate of 21 to 42 lb. per acre of planting will be adopted by all ryots. The area brought under this improvement during the year is 80,565 acres against the total accrued area of 795,779 acres.

(c) *Manuring.*—The wet lands of the circle are deficient both in nitrogen and phosphoric acid. The high yielding strains of paddy deplete the soil fertility unless suitably manured. Ryots are therefore advised to supplement the local manure by growing suitable green manure crops and ploughing them in along with phosphatic manure.

(d) *New strains.*—Adt. 15, a mutant of Adt. 4 was tried in the district and found to give 15 per cent higher yield over local kuruvai. Trials of 5,905 strain (selection of konakuruvai) have given 10 per cent higher yield than local sarapali. This variety is appreciated for its fine quality and higher percentage of rice and fetches a premium of four annas per 100 lb. in the market. Avasara samba, an early variety obtained from Tinnevelly, has been tried in six places in Trichinopoly district. The crop is now in good condition.

(ii) *Cumbu.*—The crop occupies 261,510 acres and is confined to Trichinopoly district.

Trials of Punjab cumbu proved its superiority over local cumbu under irrigated conditions but its longer duration is a limiting factor for its expansion. In Musiri taluk where this crop is appreciated the ryots have reserved 500 lb. of seed for future sowing. The Jamnagar Giant cumbu trials have been favourable.

(iii) *Cholam.*—Trials were conducted with A.S. 1543, 1575 and 2095 in Karur and Kulitalai taluks. In Karur, the crop is standing, while in Kulitalai though the ear-heads of 1575 were large, A.S. 2095 gave about 15 per cent increased yield over the local and the latter strain is liked by the ryots. The strains A.S. 29 and 1098 are suited for dry conditions, and are being raised mostly for fodder purposes as the grain is not liked for consumption.

(iv) *Ragi.*—E.C. 593 ragi was cultivated in about 215 acres in Trichinopoly district and 5,840 lb. of seed have been reserved by ryots. As this strain is longer in duration by 10 days than the local, E.C. 3517 was tried in Kulitalai taluk. It was found to be earlier by a week and to give 9 per cent increased yield.

As in the case of cumbu and cholam the release of high yielding strains suitable for this tract is awaited.

(*b*) *Sugarcane*.—This forms one of the economic crops that can be rotated with paddy. The Coimbatore thin canes Co. 281, 352, 353 and 355 are spreading rapidly in the circle as they are of shorter duration, require less cultivation expenses and withstand drought and water-logged conditions. Fiji B has completely replaced the local thick cane (rasthali) in Karur taluk. One thousand five hundred and fifty acres and under improved manuring.

P.O.J. 2878 and Co. 419 are the two new varieties which find favour with ryots and have a good future. Co. 219 and Co. 402 are under trial.

Improved canes occupied an area of 2,707 acres as against the total cane area of 6,200 acres for the circle.

The scope for raising sugarcane in the Tanjore delta as a commercial crop is limited due to difficulties in irrigation and drainage and want of a factory in the vicinity. Three hundred and seventy-eight acres were under cane in Tanjore district which represents 45 per cent of the total area under cane. Messrs. Parry & Co. continued to purchase canes from Shiyali, Kumbakonam and Negapatam taluks. If the company were only to purchase the canes on a large scale the extension of cane cultivation in the delta will receive an impetus. In the meantime the Public Works Department is arranging, in consultation with our department, to fix certain areas suitable for sugarcane cultivation.

Fifty acres were trenched with Victory plough and 1,463 acres were under line planting with wide spacing. Fifteen demonstrations of better methods of jaggery making and 18 demonstrations of cream jaggery preparation were conducted. Thirty-two improved furnaces were constructed and 2 cane mills were distributed.

Sugar factories.—The sugar factory registered last year under Indian Companies Act at Karur is expected to commence work early next season. The cost of cultivation of sugarcane in the factory areas was studied in detail.

(*c*) *Fibres—Cotton*.—Distribution of improved strains of cambodia and karunganny cotton seeds and line sowing of cambodia formed the main lines of improvement. Seventeen thousand five hundred and eighty-eight pounds of Co. 2 cambodia, 5,429 lb. of A. 10 karunganny cotton seeds were distributed departmentally.

Under departmental guidance a ryot of Manapparai had his seed-farm cambodia kapas ginned at Dindigul and distributed 15,200 lb. of seed sealed with departmental seal. Eighty acres of Co. 2 cambodia have been raised under seed-farm this year.

Five thousand one hundred acres were under Co. 2 Cambodia, 296 acres under A. 10 karunganny and 320 acres under C. 7 karunganny. The area under cambodia cotton in the Trichinopoly district is 45,000 acres and that of other cottons is 16,000 acres. It

is found extremely difficult to obtain data as to the amount of improved seed brought and sold in the district by traders from Tiruppur.

Five thousand one hundred and sixty-five acres of cambodia have been sown in lines.

Two strains of cambodia and 4 strains, viz., L3-4/4, C6-3, KPT. 1 and 4714 were further tried in the district and pickings are not yet over.

(*d*) *Oil-seeds*—(i) *Groundnut.*—The area under the two varieties, viz., H.G. 1 and A.H. 25 is increasing. A.H. 32 bunch variety is liked for its earliness and better price. Six hundred and four pounds of Gudiyattam bunch, 1,810 lb. of A.H. 25, 159 lb. of A.H. 1 and 420 lb. of local Mauritius were distributed. The area under these were 188 acres. Forty-two thousand five hundred and seventy pounds of the improved varieties sufficient for 350 acres have been reserved by ryots for seed.

(ii) *Coconuts.*—Two thousand two hundred and twenty-eight seednuts and 18 seedlings from Kasaragod were supplied to ryots. Due to increased demand 1,250 seednuts and 3,565 seedlings were arranged to be supplied from Adirampatnam. Five hundred and thirty acres were inter-cultivated with iron ploughs and 226 acres manured with leaf.

(*e*) *Fruits.*—The growing of fruit trees is becoming popular due to departmental propaganda. During the year the following grafts and plants were arranged to be supplied from nurserymen :—

Mangoes ..	3,521	Oranges	319
Pomegranates ..	103	Grapes	87
Jack	20	Pine-apple	366
Sapotas ..	129	Figs	20
Guavas ..	56	Bher	19
Limes	1,084		

Along with the distribution of approved plants clean cultivation of gardens, proper spacing and manuring, raising of suitable subsidiary and catch crops were advocated. Insect pests and fungus diseases were controlled by spraying. It is encouraging to note that a few interested ryots of the circle have taken to grafting of mangoes and have sold nearly 2,500 grafts.

Plantains.—As a money crop this has been introduced in wet lands of Tanjore district and the area is on the increase. During the year 128 acres were under this crop as against 100 acres of last year. About 137 suckers of different varieties of plantain were obtained from Coimbatore and supplied to ryots for trial. Eight hundred and five acres were under improved manuring. The raising of sunnhemp in young gardens and the use of artificial manures were advocated.

Cashewnut.—Due to departmental propaganda the area under this hardy and profitable crop is on the increase. About 50 acres have been newly brought under this plantation.

(*f*) *Vegetable crops.*—Seeds of select varieties of brinjals, beans, radish, carrots, soya-beans, tomatoes, melons, etc., were obtained from Aduturai station and distributed to ryots. Five hundred and sixty-six ounces of vegetable seeds were supplied. One hundred and thirty-one pounds of soya-bean seeds have also been supplied.

(*g*) *Spices and narcotics—Dhulia onion.*—Forty-nine pounds of seed sufficient for 16 acres were supplied to ryots. Though the ryots obtained a good crop, the area is not on the increase due to marketing difficulties.

(*h*) *Other crops*—(i) *Casuarina.*—60,000 seedlings of casuarina were arranged to be supplied from nurserymen in Cuddalore.

(ii) *Turmeric.*—This forms one of the rotation crops with paddy. In place of the usual application of castor cake a reduced dose of cake with niciphos was advocated. About 50 acres were thus manured.

(iii) *Fodder crops.*—On account of the availability of plenty of paddy straw in wet areas, the need for growing large areas of fodder crops is not felt by ryots. But to give better quality of fodder to cattle, ryots were advised to grow fodder cholam, pillipesara, and Kolakattai grass and to raise Guinea and elephant grasses to serve as green fodder. One thousand three hundred and ninety-one pounds of cholam seed and 1,851 lb. of pillipesara seed were distributed.

3. *Implements.*—The necessity and advantage of using more efficient iron ploughs is emphasised and demonstrated to ryots. Due to the clayey nature of soil and weak animals in the wet areas, the scope for usage of iron ploughs is limited. As a result of 1,135 demonstrations with iron ploughs and 327 demonstrations with other implements, 505 ploughs of different types, 750 spare parts and 160 mhote wheels have been distributed. In addition one improved waterlift, two sugarcane mills and one disc harrow were obtained for the ryots.

4. *Loans.*—The issue of takkavi loans has brought the improved implements within easy reach of the ryots. A sum of Rs. 2,500 has been disbursed under the Special Loan Rules to 243 loanees.

5. *Manures*—(i) *Cattle manure.*—Much attention was devoted to the proper methods of storage of cattle manure. Though this improvement is simple and can be easily adopted by every one, the ryots are slow in adopting this improvement due to their indifference. Due to intensive propaganda the following improvements were effected :—

Loose box	18
Dry earth sheds	602
Byre system	74
Compost pits	219
Manure pits	930

(ii) *Composts.*—The Municipality of Karur continued to adopt the Indore process of composting the habitation waste and distributed the manure for demonstration.

(iii) *Green manure crops.*—This was encouraged wherever possible and the area is increasing. Fifty-two thousand two hundred and fifty-two pounds of green manure seeds were sold departmentally and 539,175 lb. by other agencies. The area under green manure was 91,971 acres.

Private dealers, co-operative agricultural societies and other organized bodies were encouraged to stock and distribute the seeds to ryots. The requirements of other circles in respect of kolinji and sunnhemp were also met from this circle. Two thousand pungam seedlings were supplied to the Executive Engineer, Cauvery-Mettur project area, Tanjore, for planting along canal bunds to serve as a binder and to supply green leaf manure.

(iv) Ryots were also advised to use phosphatic manures in conjunction with green leaf. Forty-eight thousand, eight hundred and twelve pounds of bone-meal were arranged to be supplied to ryots.

(v) Use of artificial manures is becoming a common practice and several firms are stocking and supplying them.

6. *Pests and diseases.*—The Mycology and Entomology Assistants continued in this circle with headquarters at Aduturai. In addition to their routine work both of them attended the hairy caterpillar campaign. The Entomology Assistant attended to 35 reports of insect damage. The study of biological control of the daincha caterpillar was continued by him. The Mycology Demonstrator attended to the selection of cane setts for planting and spraying of mangoes, citron and grape-vine gardens besides examination of ' Piricularia ' resistant strains of paddy.

The demonstrators of the circle carried out remedial measures for diseases on crops, viz., ' thrips ' on chillies, ' hopper ' on mangoes, ' aphids ' on tobacco, ' mildew ' on grapes and ' die-back ' on citrons.

7. *Pest Act*—(i) *Groundnut.*—The Pest Act for the control of hairy caterpillar ' Amsacta albistriga ' on groundnut and cumbu was enforced this year in four firkas of the Udayarpalayam taluk and it was extended to three firkas in Musiri taluk. Campaigns were arranged to combat the pest and the remedial measures advocated by the department were adopted by ryots. Altogether there were four emergences in Udayarpalayam taluk and three in Musiri taluk. Due to late rains the damage was not severe this year in the Pest Act area.

The pest made its appearance in Tanjore, Pattukkottai and Karur taluks and the damage to groundnut, cumbu and cotton was severe. In Tanjore and Pattukkottai the incidence of the pest was for the first time.

(ii) *Cambodia cotton.*—The Act, as usual, was enforced throughout the Trichinopoly district. Eradication was complete in Trichinopoly, Karur and Udayarpalayam taluks before 1st September. In Kulittalai taluk there was a long delay in removing

the plants due to the crop being sown in dry lands late in November-December. The crop was completely eradicated by the 15th of October. In other taluks the crops was removed by the 15th September. There was no necessity to enforce the penal provisions of the Act.

The Pest Act was enforced in Pudukkottai State also this year for the first time.

(iii) *Water hyacinth.*—The Act in respect of this acquatic weed was in force throughout the circle. Ryots were advised to remove and compost the material collected.

8. *Trial plots.*—One hundred and three trial plots were laid for various crops during the year.

9. *Demonstration plots.*—The minimum of 50 demonstration and trial plots for each sub-circle was kept in view and 925 demonstration plots were arranged during the year under report.

10. *Joint work with co-operative and other departments.*—There were 11 co-operative agricultural societies functioning, 9 in Tanjore and 2 in Trichinopoly district. They attended to (i) demonstrating the improvements recommended by the department, (ii) multiplying and distributing improved strains, and (iii) distributing manures by acting as the agents of the manure firms. The Kumbakonam Co-operative Agricultural Society, the Co-operative Stores at Kadiramangalam and Nidamangalam and the Lalgudi Sivagnanam Co-operative Agricultural Society have done good work. They have distributed 37,732 lb. of paddy seeds, 61,679 lb. of green manure seeds, 76,168 lb. of bone-meal and 140,028 of oil-cakes. The loan and sale section of the Lalgudi Sivagnanam Co-operative Agricultural Society has issued loans to ryots on pledge of agricultural produce amounting to Rs. 29,692. The Loan and Sale Society at Vallam has undertaken to multiply A.H. 25 groundnut under seed-farm conditions and 1,000 lb. of seed have been supplied for this purpose.

At the request of the District Collector and the Executive Engineer, Trichinopoly, I made a special report on the reclassification of the sanded areas of Mutharasanallur and about the irrigation needs of the wet lands of Krishnarayapuram.

At the request of the Superintendent, Central Jail, Trichinopoly, a cropping scheme was drawn up for the cultivation of the jail lands and timely help was rendered whenever required.

11. *Agricultural associations.*—Inclusive of the two District Agricultural Associations of Trichinopoly and Tanjore there are 50 taluk and village agricultural associations. The District Association of Trichinopoly conducted the agricultural exhibition at Srirangam during the Vaikunta Ekadasi festival on an elaborate scale. The Tanjore Delta Mirasdars Association continued to issue the journal ' Mirasdar '.

The taluk and village agricultural associations were induced to take greater interest in agricultural activities.

12. *Agricultural exhibitions and shows.*—Seventeen exhibitions were held of which those at Trichinopoly, Karur and Vedaranyam were on a large scale. The exhibition at Srirangam was opened by J. B. Brown, Esq., District Collector, Trichinopoly, on the 11th December and it was run for ten days. At the exhibitions at Karur and Srirangam an agricultural drama 'Absentee Landlord' was enacted by the demonstrators of the circle. The exhibitions were largely attended and proved very instructive.

The department participated in the health week exhibitions at Trichinopoly, Srirangam and Mayavaram.

13. *Lectures and conferences.*—The demonstrators attended the Ryots Conferences held during jamabandi in 14 taluks and advised the ryots on agricultural matters. Specimens of seeds, implements, etc., were shown to them.

Forty-six magic lantern lectures and 114 ordinary lectures were given.

14. *Livestock improvement.*—There are 45 bulls of approved type of which 17 are under premium scheme. Twenty-four bulls were maintained by the District Board, Tanjore, on contribution basis and one as departmental loan to panchayat, and three by district jails. In addition there are 16 stud bulls maintained by individual ryots and herdsmen.

15. *Apiculture.*—Ninety-three colonies were hived during the year. Five hundred and sixty-two colonies are at work as compared with 339 colonies of the previous year and 448 lb. of honey have been extracted. An interesting film on "Bee-keeping" showing hiving of wild colony and the methods of rearing and extraction of honey was produced by Sri. N. Seshagiri Rao, District Traffic Superintendent, South Indian Railway, and this was projected during the health week celebrations at Trichinopoly.

16. *Poultry.*—The Agricultural Research Station, Aduturai, was the main source for the supply of eggs and fowls of pure breeds to the ryots in this cricle. Some ryots also have taken up to the rearing of these breeds and supply of eggs for setting. The Servindia Centre, Mayanur, also supplied eggs and fowls of improved breed. One thousand ninety-nine eggs for setting and 128 birds of pure breeds were distributed during the year under report. To maintain the purity of breed caponizing of all local cocks was advocated.

17. *Motor van.*—The Exhibition Motor Van, III unit toured in the taluks of Shiyali, Mayavaram, Negapatam, Nannilam, Tiruturaipundi and Pattukkottai from 1st October 1937, to 16th December 1937. The officers of the Veterinary and Health departments accompanied the van wherever possible. Besides explaining the exhibits, magic lantern lectures were delivered.

18. *Crop cutting experiments.*—The experiments were continued this year also in the circle in respect of paddy, cumbu, ragi, cholam and sugarcane.

19. *Economic councils.*—These were functioning in the early part of the year and with their abolition periodical conferences of the Gazetted Officers of the various departments were held to discuss rural problems.

20. *Sale of publications.*—1,014 villagers' calendars and 90 bulletins were distributed.

III.—Research Stations.

A. Agricultural Research Station, Aduturai.

1. *Charge.*—Sri M. Anandan continued to be in charge of the station throughout the year.

2. *Crops—(a) Paddy.*—Fifteen strains have been released so far. Two more strains of kona-kuruvai and muthu samba will be released in the coming season. Ninety-one thousand four hundred and seventy-five pounds of paddy seeds were distributed to the circle officers and about 90,000 lb. were stocked for distribution in the coming season.

Selection work.—Selections from swarnawari, manakathai, vellai kar, and mattai kar were under study. 7,306 bulk, progeny of Adt. 3 × Adt. 2 cross, with sirumani shape of grain and duration of Adt. 3 gave an increased yield of 15 per cent over local kuruvai. 'Piricularia' resistant cultures from the progenies of cross between korangu samba × GEB. 24 were tried on the station and in the district. This trial will have to be repeated as the disease failed to appear in both the places.

(b) *Commercial crops.*—Sugarcane and groundnut were cultivated in rotation with paddy. Co. 419 among thick canes and Co. 281 among thin canes yielded 50 and 37 tons of canes per acre respectively. Groundnut strains A.H. 25 and A.H. 32 recorded good yields of pods and haulms. Among the cotton varieties tried in wet lands Co. 2 yielded 705 lb. kapas per acre.

3. *Livestock.*—One Kangayam and one Ongole bull were under stud. Dairy stock comprised of 6 cows and 2 bull calves and 6 heifers.

4. *Poultry.*—There were 195 birds in the beginning of the year and 117 were added. The stock at the end of year was 152 birds after selling 81 birds and writing off 79 deaths. Of 6,965 eggs produced during the year 848 were sold for hatch and 5,295 for table purposes.

5. *Apiculture.*—Thirteen colonies were at work and 18¾ lb. of honey were extracted.

6. *Vegetables.*—Thirty-four varieties of vegetables were under trial during the year. By sale of vegetables from 1·20 acres a profit of Rs. 155 was realized. Forty-seven pounds of seeds of all vegetables were sold from the station.

B. Agricultural Research Station, Pattukkottai.

1. *Charge.*—Sri T. G. Muthuswami Ayyar continued to be in charge throughout the year assisted by Sri S. Venkatarama Ayyar, assistant farm manager.

2. *Soils.*—As indicated in previous reports the soil of the farm is light and porous and is deficient in nitrogen and phosphoric acid. The soil requires large quantities of organic matter as cattle manure, village refuse and green leaf. With the rapid expansion of wet cultivation manuring is becoming a serious problem. It has been found that kolinji and indigo come up well when sown after paddy harvest and sunnhemp can be successfully raised after the receipt of water in the channel.

As the price of paddy has not apppreciably increased the following cropping was tried to get maximum outturn with minimum expense. The following were the observations made and results obtained.

(*a*) In single crop wet lands Adt. 10 paddy alone gave a net profit of Rs. 32–14–0. On the other hand a double crop, viz., groundnut followed by paddy gave only a net profit of Rs. 25–0–3.

(*b*) In double crop area a single crop samba is more profitable than two paddy crops. Single crop gave a profit of Rs. 23–14–5 while kuruvai followed by samba a loss of Rs. 2–5–7. The above show that the lands cannot stand two crops before being enriched fairly well.

(*c*) An early groundnut A.H. 32 followed by samba is more profitable than a kuruvai followed by samba by Rs. 30–1–3.

(*d*) Turmeric and plantains will be profitable only when the soil fertility has been improved. Turmeric yielded only 3,060 lb. per acre as against the normal of 15,000 lb.

(*e*) Cambodia cotton after paddy has failed due to the absence of organic matter and as the soil becomes hard the crop is unable to withstand summer.

(*f*) Co. 281 cane planted in June after the receipt of canal water is standing. The cane has not come up well due to the rise of sub-soil water when the surrounding fields are irrigated.

(*g*) Varietal trials of paddy strains of Aduturai and Coimbatore were conducted.

(*h*) Bellary onion and Devanam onion have fared well, considering the poor nature of soils. The yields have been 2,890 lb. and 3,220 lb. per acre.

The average yield of crops show a tendency to increase year after year, when well manured, indicating the need for judicious manuring.

TRICHINOPOLY,
7th May 1938.

R. N. K. SUNDARAM,
Deputy Director of Agriculture, V Circle.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, VI CIRCLE, MADURA, FOR 1937-38.

I.—Charge.

Sri C. Ramaswami Nayudu continued to be in charge of the circle till 20th July 1937. Sri R. N. K. Sundaram officiated from 21st July 1937 till I took charge on 15th November 1937. I continued to be in charge except during my leave period from 25th November 1937 to 2nd January 1938. Sri A. Gopalan Nayar, Assistant Director of Agriculture, Tinnevelly, was in additional charge of the circle from 3rd December 1937 to 2nd January 1938. The Madura division was in charge of Sri V. T. Subbayya Mudaliyar, till 14th September 1937 when Sri E. K. Nambiyar took charge and continued till the end of the year. The Tinnevelly division was in charge of Sri S. Narayana Ayya till 20th July 1937 when Sri A. Gopalan Nayar took charge and continued till the end of the year.

II.—Agricultural Education.

1. The Agricultural Middle School, Usilampatti, maintained by the Madura District Board was run with Sri V. G. Dhanakoti Raju as the Headmaster and Sri P. R. Subramania Ayyar as Farm Superintendent who were both lent by the Agricultural Department.

There were 21 students to begin with, but 8 of them had to be sent away during the year in the interest of school discipline. The students, in addition to the instruction given by the school staff, had special practical training given by the Touring Veterinary Assistant Surgeon and the Assistant in Entomology and the Mycology Demonstrator attached to my office. They were examined by the District Educational Officer, Madura, the Headmaster of the school and the Assistant Director of Agriculture, Madura, and twelve were declared passed and one failed.

2. The Board Industrial School, Muthanendal, which was started in July 1935, was removed to Sivaganga to a better site during 1937. Here elements of Agriculture, Bee-keeping and Poultry are also taught, besides weaving, carpentry, etc. The course covers a period of two years and so the first batch of students, 23 in number, completed their training in May 1937. Of these, twelve appeared for the Government Technical Examination in Agriculture Lower, and nine came out successful with one first class. Fourteen and seventeen students were admitted in the second and third years, respectively, and they are in the II and I year classes.

3. Agriculture continued to be a subject in 'C' group in the Secondary School-Leaving Certificate curriculum in the Board High Schools at Pasumalai, Koilpatti, Tenkasi and Rajapalaiyam.

Each school has a trained Agricultural instructor with a small demonstration farm attached to it. These institutions were having the necessary advice from the officers of the Agricultural department.

III.—District Work.

1. *Season.*—In Madura district hot weather rains were favourable for preparatory cultivation but as the south-west monsoon was feeble in June and July, early sowings in dry lands were delayed till August resulting in slight decrease in yield. Late sowings, which are the main sowings in dry lands, were done in time but the crops were affected on account of failure of north-east monsoon rains from the middle of November 1937 to middle of February 1938. Wet crops except under the Periyar project suffered much, particularly in Ramnad district, being dependent on rainfed tanks. In Tinnevelly district, south-west monsoon rains were not only late but meagre resulting in poor yield of dry crops and the kar (early) season paddy. The north-east monsoon rains were normal in the beginning but the drought that persisted in December 1937 and January 1938 had an adverse effect on late dry crops and Pishanam (second crop) paddy. In Ramnad district the season was fairly normal except in taluks towards Madura district, which experienced the season conditions indicated under Madura district.

2. *Crops*—(*a*) *Paddy*—(i) *Varieties.*—In addition to trials of fresh strains, demonstration and multiplication of approved strains formed the main work in this crop. G.E.B. 24, Adt. 11 and Co. 2 in Madura division and Co. 8, Co. 9, G.E.B. 24, Co. 1, Co. 2, Adt. 3 and Adt. 11 in Tinnevelly division are the strains that were demonstrated and multiplied and the strains that are under trial in the circle are Adt. 2, Adt. 3, Co. 1, Co. 8, A.E.B. 148, Burma hybrids Nos. 10783, 10905, 10998, 11340 and 5170.

(ii) *Seed distribution.*—Nearly 953 acres were grown with approved strains under seed farm conditions to produce pure seed, besides supplies arranged between ryots.

(iii) *Cultural improvements.*—This is on the increase owing to the introduction of small and cheap iron ploughs made in India besides the introduction of the system of thin sowing and economic planting. The area planted economically in the circle is estimated to be 114,338 acres.

(iv) *Green manuring.*—This is gradually increasing in wet areas—the chief crops being Kolinji, Daincha, Pillipesara, and Sunnhemp. The total green manure seed distributed departmentally was 28,572 lbs. in addition to large quantities sold by private dealers.

(*b*) *Cotton.*—The area under improved strains of cotton is on the increase. Drill-sown area is also on the increase particularly in the Tinnevelly district. One lakh twenty-one thousand four hundred and thirteen pounds of karunganni cotton seed as against 88,736 lbs. of last year and 83,294 lbs. of Cambodia

cotton seed as against 70,960 lbs. of last year were distributed to ryots during the year—the strains being K. 1, A. 10, C. 7 of karunganni and Co. 2, C.S. 1267, C.S. 920 of Cambodia cotton. One thousand two hundred and one acres under karunganni and 284 acres under Cambodia cotton were arranged under seed farm conditions during the year as against 1,098 acres of karunganni and 221 acres of Cambodia cotton of last year. The estimated area under the improved strains is 147,171 acres under karunganni and 49,808 acres under Cambodia cotton as against 135,878 and 45,909 acres, respectively.

(c) *Millets—Cholam.*—The improved strains that were distributed are A.S. 2095 and A.S. 367 and these are estimated to have covered an area of 66 acres.

Cumbu.—The area under improved strains in this crop is 567 acres as against 205 acres of last year. Punjab cumbu and cumbu No. 5 of Koilpatti farm are the two strains that are being distributed.

Ragi.—E.C. 593 and E.C. 24 were tried in regular trial plots in Madura district resulting in better yield in the case of E.C. 593 only over the local in Madura district whereas E.C. 24 fared better in Tinnevelly district. The trials will be continued.

(d) *Fodders.*—The Madura Municipality, the Palani Devastanam and the Fathers of the Sacred Hearts College in Kodaikanal Hills continue to grow Guinea and elephant grasses as reported last year. Two thousand four hundred and seven pounds of Periamanjal cholam, 20 lbs. of Maize, 85 lbs. of Teosinte, 148 lbs. of Kolakkattai grass, 22 lbs. of Lucerne, 126 lbs. of Kollaganjeru seeds, 341 lbs. of Pillipesara, were distributed to ryots for fodder purposes in addition to 11,200 slips of guinea grass. Silage was made in Tinnevelly division.

(e) *Fruits.*—The area under fruit trees is increasing in preference to other crops wherever water facilities are present, particularly in the lands of those who own extensive areas but cannot attend to ordinary garden cultivation requiring more of personal attention. The help rendered by the department was obtaining suitable fine varieties and giving necessary advice in planting, manuring, pruning, spraying and inter-cultivation. During the year the Demostrators have arranged supply of 3,657 mango grafts, 575 orange seedlings, 113 sapotas, 1,165 seed coconuts, 100 coconut seedlings, 179 grape vine cuttings, 64 limes and miscellaneous fruit plants numbering 183.

(f) *Oil seeds.*—The improved varieties of groundnut, particularly the short duration Spanish bunch variety, are finding favour with the ryot. Four hundred and sixty-eight pounds of A.H. 32, 1,074 lbs. of Spanish bunch variety, 1,382 lbs. of A.H. 25 and 25 lbs. of A.H. 45 were distributed to the ryots.

(g) *Spices.*—Bellary onion is becoming popular mostly round about towns and big villages. Sixty-eight pounds of seed were distributed to the ryots.

(*h*) *Sugarcane.*—The area under the crop is not increasing due to low price of jaggery. Of all the varieties introduced so far only Fiji B has become popular in the circle. Seven lakhs seven thousand and thirty-seven setts of improved varieties were supplied to the ryots during the year. The total area under improved varieties of canes was 214 acres. Sixteen cream jaggery demonstrations were conducted with success, but due to the high cost of activated charcoal, ryots are not willing to follow the method.

3. *Implements.*—Improved ploughs, inter-cultivators, sprayers, Roll Easy mhote wheels, etc., were demonstrated in ryots' fields. Two thousand one hundred and ninety demonstrations were conducted in all and as a result, the following sales were effected, most of the sales being under Takkavi loans—

Iron ploughs	790
Spare parts for iron ploughs	568
Improved guntakas	16
Seed drills	18
Mhote wheels	124
Chaff cutters	2
Junior Hoes	27
Bund former	14
Digging forks	13
Sprayers	40
Buckscrapers	2
Drill sets	258
Honey extractors	1
Cooper's Persian wheels	3
R.E. guntaka	1

4. *Manures.*—The proper conservation of farm-yard manure and green manuring of wet lands formed the chief items of work done by the Demonstrators. The work turned out by them was, 1,948 manure pits, 225 dry earth sheds, 50 byres, 374 heaps covered with earth, 9 trenches in cattle-sheds to catch urine and 103 composts. The Indore process of preparing night-soil compost was introduced in Madura and Tinnevelly Municipal depots and the same is being continued. Oil cakes and artificial manures in combination with organic manures were advised to be used by the ryots, as farm yard manure was found insufficient.

5. *Pests and diseases.*—The Agricultural Demonstrators in Entomology and Mycology attended to 134 and 16 calls respectively for remedial measures against pests and diseases. The important pests and diseases treated were thrips on chillies, pomegranate fruit-borer, hopper on mangoes, die back on fruit trees, mildew on grapevine, stem bleeding disease on coconuts and wilt in plantain.

6. (*a*) *The Cotton Pest Act* was in force in Madura district. The crop was pulled out in time in almost all the places. In a few places where the rule was not observed, necessary action was taken for the removal of the crop. There was thus no need for any prosecution.

(*b*) *Cotton Control Act* prohibiting the cultivation of Pulichai cotton was in force during the year. This cotton was found only as stray plants in the main crop, but they were removed in all cases after issue of notice.

7. *Trial plots.*—Sixteen trial plots were arranged during the year, i.e., 4 in paddy, 8 in ragi, and 4 in cotton. The yields of cotton are not known as the picking is not yet over. In ragi the results of trials are not conclusive and so the trial will be continued. In paddy, Co. 3 has given an extraordinary yield of 6,000 lbs. grain per acre in Madura taluk. This has to be tried again.

8. *Demonstration plots.*—Nine hundred and eighty-two plots were laid out during the year. Of these, 487 were cultural, 392 were varietal and 103 were manurial plots.

9. *Co-operative work.*—The usual co-operative work with other departments, like holding agricultural exhibitions during Health weeks, and forming marketing societies with the help of the Co-operative department was done. There are four co-operative societies helping the agriculturist in Madura district and three in Tinnevelly district.

10. *Agricultural Associations.*—Six agricultural associations have been started in Tinnevelly district during the year to obtain the co-operation of the non-officials and thus increase the activity of the Agricultural department.

11. *Exhibitions and Fairs.*—Fourteen big and 26 small exhibitions were held during the year at the time of festival and health weeks. Ploughing and weeding competitions were held at Kosavapatti in Dindigul taluk at exhibition time and Tallakulam in Madura taluk at the time of cattle fair, and prizes in the form of ploughs and mhote wheels were awarded. Ploughing demonstrations were held during some of these exhibitions. The Exhibition Van, Unit III, toured in the circle, for about three months and visited 84 villages.

12. *Lectures.*—Twenty-six lantern and 114 ordinary lectures were delivered during exhibitions, jamabandi camps and during the tour of exhibition van.

13. *Improvement of Livestock.*—The number of premium bulls at the beginning of the year was 36. Eleven bulls were brought under the scheme during the year. Seven bulls were discharged from the scheme thus leaving 40 under the premium scheme at the end of the year.

Poultry.—Fifty birds of improved breeds of fowls and 188 eggs were distributed during the year. The demand for these birds is on the increase near towns, but not in villages.

Bee-keeping.—There is growing demand for bee-hives more from educated public. Thirty-two hives have been supplied during the year.

14. *Loans.*—Takkavi loans were given to the extent of Rs. 6,830 for the purchase of small agricultural implements. Seven hundred loan applications were received and 640 were disposed of.

15. *Publications.*—Three thousand and seventy-one Villagers' Calendars, 247 bulletins, 4 books on Livestock and 3 of Wood's Facts and Figures, were sold.

16. *Korai cultivation.*—No work was done in this direction by the department in the circle.

IV.—Research.

Agricultural Research Station, Koilpatti.

1. *Charge.*—Sri R. Chockalingam Pillai continued to be in charge throughout the year. Sri S. Kutti Mudali, Farm Manager, was posted with effect from 3rd May 1937 and Sri S. Muthuswami, Farm Manager, was transferred from 10th July 1937. The headquarters of the Mycology Demonstrator and the Assistant in Entomology were transferred from the Farm to Madura from 1st June 1937.

2. *Season.*—The rainfall was not only below the average but was badly distributed. The season in general was rather unfavourable for all crops and pulses in particular.

3. *Crops—(a) Cotton.*—The work of the isolation of low shedding varieties of cotton under late rain conditions is being continued. The crop occupied 51 acres and the yield obtained so far is much below the average. During 1936–37, the average yield was 357 lbs. per acre. That it is most economical to irrigate cambodia cotton grown in red soils once a week, has been confirmed by this year's results.

(*b*) Cumbu occupied an area of 18 acres giving an acre yield of 450 lbs. grain against a 28-year average of 465 lbs.

(*c*) Irungu cholam sown over an area of 30 acres produced 3,922 lbs. straw per acre but the grain yield was very poor.

(*d*) Sugarcane varieties grown in red soil under irrigation gave an acre yield of 50 tons per acre.

(*e*) *Miscellaneous crops.*—Maize as green fodder produced over 25,000 lbs. per acre, Bellary onions produced over 11,000 lbs. bulbs per acre and Guinea grass gave over 64,000 lb. of green fodder per acre.

4. *Pests and diseases.*—The surface weevil on cotton and grass hoppers on cumbu in black soils did some damage. Piricularia appeared on ragi in a mild form.

5. *Cattle.*—There were 32 animals at the beginning of the year. Thirteen animals were received and 20 were disposed of during the year, leaving a balance of 25 at the end. The Ongole

herd was replaced by Scindhi animals. The breeding bulls did 276 services in all.

6. *Poultry.*—There was an outbreak of fowl-pox in the flock. Between White leg horns and Rhode island reds, the former was found more susceptible to disease and so they were disposed of and Rhode island reds multiplied. There were 37 birds in the beginning of the year. One hundred and seven were received by hatching and transfer from outside. Thirty-five birds were sold, 25 died, leaving a balance of 84 at the end of the year.

7. *Ginnery.*—Nineteen thousand two hundred and forty-two pounds of farm kapas and 21,701 lbs. of seed farm kapas were ginned at the farm ginnery.

8. *Seed distribution.*—Six thousand eight hundred and sixty-seven pounds of cotton seed, 1,088 lbs. of cholam, 294 lbs. of cambu, 336 lbs. of ragi, 1,523 lbs. of groundnut, 139 lbs. of maize and teosinte, 5,850 slips of Guinea and elephant grass and 2,775 sets of sugarcane were distributed.

9. *Petty construction and repairs.*—Besides the annual repairs to buildings, extension of the laboratory was done at a cost of Rs. 1,350.

10. *Students under practical training.*—Five students were selected and all of them underwent the full four months' training. They were given short lessons in Agriculture in addition to practical work.

Rice Research Station, Ambasamudram.

1. *Charge.*—Sri M. Subbiah Pillai, Assistant in Paddy, held charge of the station throughout the year. This is the first year of work.

2. *Season.*—The total rainfall of 26·05 inches was not only below the previous ten-year average of 42 inches but was badly distributed. The season on the whole was not favourable.

3. *Crops—(a) Paddy.*—Three thousand single plant selections, all told in Kar, Pishanam and Manavari seasons were made for further study, besides mass selection in bulk varieties of Arikaravi and Swarnavari. Three hundred and eleven single earhead selections were grown and examined and the promising lots collected for trial in the next season. Twenty-five strains of different varieties obtained from other stations were put under comparative trial and heavy yielders recorded. One hundred and sixty-four types were grown and studied in both the seasons.

4. *Petty construction and repairs.*—The construction of a tiled cattle-shed, a manure pit protected by a thatched shed, a threshing floor, a drying cage, and complete fencing of the station were executed during the year.

MADURA,
3rd May 1938.

T. BUDHAVIDHEYA RAO.
Deputy Director of Agriculture, VI Circle.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, VII CIRCLE, TELLICHERRY FOR THE YEAR 1937–38.

I.—Charge.

I remained in charge throughout the year. There was no Assistant Director in the circle.

II.—Demonstration.

Season.—The total rainfall showing the seasonal rains for the year is given below :—

District.	Hot weather.	South-west monsoon.	North-east monsoon.	Total.	Average for past five years.
South Kanara ..	7·91	141·72	13.96	163·59	154·25
Malabar	13·48	82·74	21·37	117·59	125·13

The total rainfall in the Malabar district was below normal while it was a little above in the South Kanara district, but in both the districts the distribution was uneven. Hot weather rains were poor. Though there were a few early showers in March, April was rainless. Rains received in May were apparently monsoonish and slightly upset the ryots' routine. Sowings done with these rains had an uneven germination with plenty of weeds. The dry interval before a late monsoon affected them. The south-west monsoon set in rather late delaying the transplanting of the paddy crop. The rains continued heavily for a time helping the incidence of mahali on arecanut and slightly spoiling the first crop paddies in flower and the fresh sown second crop paddy nurseries. The unusually long break between the two monsoons also told upon the late first crop of the year and the second crop nurseries in garden lands. The pepper vines had a first flush with the early rains and the seasonal flushing was consequently weak resulting in a poor crop. The shortage of late rains, however, reduced the *pollu* infection and shedding of pepper. The north-east monsoon started well but stopped short in November. A few more showers would have assured a better yield of the second and third crops of paddy which suffered in the higher levels and coastal tracts for want of enough moisture. The monsoon rains gave a good start for ginger, but the continuous and heavy rainfall encouraged soft rot wherever the lands were not well drained. The shortage of north-east monsoon brought in the hot weather earlier and it would naturally tell upon the future yield of crops like coconut. Cold weather was less prominent and the flowering of jacks and mangoes got delayed with poorer fruiting. Garden crops and plantains are generally good. In spite of the poor distribution of rain one cannot state that the season has been very unfavourable for the circle.

Crops—Paddy.—As a result of intensive propaganda improvements have been effected by way of the increased use of better strains of seed, reduction of seed rate, thin nurseries and economic planting, growing of green manure crops, use of iron ploughs and judicious application of concentrated manures. Demonstration plots were laid out in the ryots' fields to show the merit of the improvements in a convincing manner.

Pattambi strains.—All the ten strains evolved have been distributed. They have been in high demand on account of the higher yield, purity and vitality of the seed. The progress made in this all important item of work is evident from the following figures :—

	1935–36.	1936–37.	1937–38.
	LB.	LB.	LB.
From A.R.S. Pattambi.	14,965	36,697	53,728
From ryot to ryot ..	14,285	68,644	31,661 *

* Could not be traced further.

The use of the seed of these improved strains is spreading naturally and they cover an area of about 6,000 acres. Of the strains Ptb. 2 (Ponnaryan) and Ptb. 9 (white riced Tavalakannan) are more popular on account of increased yield sometimes going up to 40 per cent and Ptb. 10 (Tekkanchira) for its short duration and cosmopolitan character. With the evolution of more strains suited to the different and peculiar tracts of the circle, and with more concentration on rapid seed multiplication, it is hoped that the local ryots' seed will soon be replaced by improved strains.

Bulk seed.—The demand for the bulk seed of varieties like Tavalakannan, Kurunkazhama, Rajakayama and Modan (Thonnooran) produced at Taliparamba Agricultural Research Station was great and the supply fell far short of the demand. The quantity that was sold to the ryots is given below :—

	LB.	
Sales from depots	10,549	20,2[illegible]7 acres.
Natural spread	51,755	

The popularity of these varieties is also due to the higher yield they brought in.

Fodder crops.—Cattle owners have been advised to raise fodder crops like Guinea grass and elephant grass and fodder cholam and cumbu. An area of about 35 acres have been brought under fodder crops—a very novel departure from the ryots' methods in the circle. Hill grass has been as usual conserved as hay or as silage. Ten silage pits have been filled during the year. The demand for silage demonstration could not be fully met by the staff owing to the very short period during which the grasses remain fit for the silo.

Fruit culture.—Cultivation of fruit trees like graft mangoes, sapotas and cashew and pine-apples, is receiving great impetus and the area is extending rapidly. The expansion during the year is as follows :—

	ACRES.
Graft mango	165
Other fruit plants	15
Cashew	892
Pineapple	12

The area under pine-apples, Kew and Mauritius, is estimated at 120 acres in the circle. The ryots were advised to increase the area under Mauritius variety to lengthen the yielding season. Due attention was paid to the cultural, manurial and varietal aspect of fruit cultivation. Marketing of the pine-apple in the season has presented great difficulties. There appears to be a very large scope in the near future for extension of pine-appple cultivation as a catch crop in coconut areas for economic reasons. This will certainly add to the already existing marketing difficulties. In South Kanara also the expansion of fruit cultivation has produced a glut and sales have become difficult. A Co-operative Marketing Society is in the way of formation at Mangalore. The Fruit-Growers' Co-operative Marketing Society, North Malabar, is receiving advice and guidance and they have been able to dispose of quite a large part of their produce in the Bangalore and other markets recommended by the deparment. Railway concession must go a good way to ease the situation and probably fruit canning may be able to solve the problem to a large extent.

Coconut.—Proper spacing, systematic cultivation and judicious manuring have been demonstrated to the ryots, especially in South Kanara, where coconut has not attained the importance which it has in Malabar. Low price has been a setback to the coconut cultivation. Seasonal factor also was unfavourable during the year. Four thousand one hundred and one seed nuts and 1,485 seedlings were supplied to ryots. About 4,000 acres were systematically cultivated, of which about 500 acres were worked with iron plough and guntaka. One hundred and sixty-seven acres received artificial fertilizers and cowgram green manure was sown in about 500 acres. Cultivation of well-manured catch crops, including fodder, is being encouraged so that the relative cost on the production of coconut may be considerably reduced and the coconut grower might ere long be able to successfully compete with the importers. Forty-nine beetle rods were supplied and extraction of beetles was demonstrated in all taluks.

Tapioca.—Cultivation of improved and short duration varieties was encouraged and 113,650 setts enough for about 30 acres were supplied to the ryots. The natural spread of the crop in plantations is receiving a setback on account of the low price and marketing difficulties.

Pepper.—22,700 cuttings were supplied to ryots, mostly in the northern taluks of South Kanara where pepper is a rarer crop. The yield of pepper during the year was poor, and the price miserably low. Such a state of affairs, as bad as the previous year, has been responsible for the premature abandonment of fairly old plantations.

Sugarcane.—Low price of paddy, protection afforded to the sugar industry, ready demand for jaggery and the availability of superior varieties have all contributed to the extension of sugarcane cultivation in the West Coast. One agricultural demonstrator has been posted to look after the sugarcane experimental work in the Kallhanpur Factory area of South Kanara district. He has commenced work with a varietal trial plot. He is also making observations on the effect of saline water on the varieties in ryots' fields and is conducting a survey of the crop in the area. Introduction of improved varieties like M. 55, J. 247, H.M. 607, Co. 213. Co. 360, Co. 421 and Co. 355 and adoption of judicious manuring and better cultural methods, crushing with improved mills, construction of fuel saving furnaces and preparation of better jaggery on scientific lines have all been effectively demonstrated and the profit in sugarcane cultivation considerably enhanced. Demand for sugarcane sets has been only partly met as suppply from both the Research Stations was only 28,200 sets while local supply arranged by the department from ryot to ryot came to 225,325 sets. The area in Malabar is about 75 acres while that in South Kanara is nearly 5,000 acres. During the year 47 improved furnaces were constructed and 116 demonstrations made in better methods of manufacturing jaggery. Three Karamat cane crushers have been purchased and kept in depots of Malabar to help the expansion of sugarcane cultivation in the district.

(*a*) *Agricultural implements.*—In order to popularize the use of light iron ploughs and other labour saving implements, 485 demonstrations with iron plough, 100 with Guntaka, 1 with buck scraper and 1 with bund former were conducted during the year. As a result of these successful demonstrations the following implements were purchased and are being used by ryots :—

Cooper 25 ..	48	Bolts and nuts ..	10
Cooper 11	1	Shares of Cooper 11 ..	2
Gurjar	6	Spare shares of monsoon plough.	3
Ridge plough ..	3	Share points of monsoon plough.	6
Monsoon	1	Digging forks ..	7
Shares of Cooper 25..	46		

The sale of 58 ploughs in all for the year is against the total of 20 ploughs for the previous year.

(*b*) *Mhote wheels.*—Provision of Takkavi loans was utilized for the purchase of 21 roll-easy mhote wheels by 18 ryots in Ponnani taluk and 6 more were purchased for ready cash as a result of demonstrations conducted. Sales in the previous year were 7 wheels.

(*c*) *Sprayers*.—89 sprayers were supplied to ryots of which 40 were given under takkavi loans. About 1,000 sprayers have been at work at the Mahali affected areas in South Kanara. One hundred and eighty-three sprayers have been sold by the Puttur Division Mahali Prevention Co-operative Society.

Manures—(*a*) *Cattle manure*.—Due to the indifference of the ryot in the collection and storage of farm yard manure a good part of the country's wealth is being lost. Intensive propaganda done by the district staff to prevent this avoidable waste resulted in 541 improved manure pits. Litter was used in 136 sheds in Wynaad alone. Due attention is also paid to the upkeep of the old manure pits.

(*b*) *Utilization of organic waste*.—To minimize the daily waste of valuable organic matter, compost manure was prepared with it and 148 demonstrations were conducted. Utilization of habitation waste by the Indore process has been taken up by the Calicut Municipality at the instance of the department.

(*c*) *Green manure*.—In the littoral tract where the scarcity for green leaf manure is being very acutely felt the cheap method of growing Kolinji as green manure has again been a major item of district work. The quantity of seed sown was almost the same as in previous year, i.e., 32,528 lb. of the departmental supply and 2,393 lb. collected by ryots locally. Self-sown area comes to about 500 acres. Kolinji has now fairly established itself in the Coastal villages in both the districts and in Palghat taluk the ryots are evincing greater interest in gathering their own seed. 474 lb. of daincha was distributed in the poor saline lands of Palghat taluk with very good result. Indigo has been tried in stiffer soils and a small quantity of sunnhemp was also sown. These will be extended in suitable localities. In order to get over the budget limitations for green manure work arrangements have been made with co-operative organizations in Palghat for the direct purchase and distribution of green manure seed as Palghat taluk has become the largest consumer of such seeds.

(*d*) *Concentrated manures*.—There was no direct sale of concentrated manures from depots. Ryots were advised to use them with natural manures and were directed to manure firms. The fertilizers noted below have been used by ryots for sugarcanes, plantain, tobacco, vegetables and coconut and the increased yield obtained have made these fertilizers popular :—

	LB.		LB.
Ammonium sulphate ..	395,280	Superphosphate ..	1,326
Nicifos	52,747	Muriate of potash ..	168
Oil cakes	9,720	Sodium Nitrate ..	3.584
Fish manure ..	239,130	Mixtures	34,985
Total ..	328·5 tons.		

Catch of fish was poor and consequently fish manure supply could not meet the demand. This fact served to increase the purchase of various other concentrates.

Pests—(*a*) *Paddy pests.*—Spodoptera appeared in a mild form in the Kole area of Ponnani and in Kurumbranad taluk in about 200 acres in all. Prompt measures were taken to combat the pest. Other pests on paddy were rice bug, rice hispa and caseworm and they were also controlled by the local demonstrators.

(*b*) *Coconut.*—Nephantis serinopa appeared in a pest form in the Coastal tracts and 7,482 trees were operated to put down the pest. Vigorous propaganda by the agricultural demonstrators and breeding of parasites by the Entomology Assistant have been arranged for.

(*c*) *Mango hopper and plant lice.*—Effective sprayings done in time saved the graft mango crop in several cases. It has created a great impression particularly in the Palghat taluk.

(*d*) *Fungus diseases—Mahali on arecanut.*—The continuous and heavy rains of June–July rendered conditions favourable for the incidence of mahali in the South Kanara district and Ponnani taluk of Malabar district. The special staff of two agricultural demonstrators and ten fieldmen with 30 climbers worked in South Kanara till the end of September doing demonstrations of plant sanitation and spraying of Bordeaux mixture. About 75 lakhs of arecanut trees were sprayed in South Kanara and 1 lakh in South Malabar. Forty takkavi loans were sanctioned for purchase of sprayers. Eighty-nine sprayers and 83,053 lb. of copper sulphate were distributed to ryots by the department. Chemicals have been sold in large quantities by private firms and there were over 1,000 sprayers working in South Kanara alone. The co-operative organization at Puttur joined hands with the department and did considerable useful work by way of distributing chemicals and sprayers on loan having sold 3,100 cwt. of chemicals besides 183 sprayers. They have passed the following resolution :—

> "The general body of the society offers its heartfelt thanks to the Agricultural department and especially to the Deputy Director of Agriculture, VII Circle, Tellicherry, for the efforts made by them for the prevention of mahali disease in this area." The supply of sprayers was facilitated by the great improvement in sprayer making effected by the Standard Furniture Company, Kallai, in particular and other makers including Mr. Suvarna of Mangalore. With the co-operation of the local sprayer makers and local agents of the European sprayers the prices were kept down. It may now be said that there is hardly any garden owner in South Kanara who is unaware of the control methods for mahali disease.

Budrot of palmyra and coconut.—The Agricultural Pests and Diseases Act, 1919, continued to be in force in respect of budrot of palms in Palghat, Walluvanad and Ponnani taluks of Malabar. One special Revenue Inspector and two agricultural subordinates continued to be on pest control work. 2,906 trees were marked

for operation and with the co-operation of the village officers most of the diseased trees were cut in the Palghat and Ponnani taluks. As the condition of infection in Walluvanad was not known, a complete survey of the taluk was undertaken and the work is in progress. The operation of the Act is extended for another year.

Demonstration plots.—568 demonstration plots were laid out in different centres of the circle in the ryots' fields on paddy and sugarcane. The improvements demonstrated pertained to the use of better strains of seed, use of improved implements, green manures and better preserved farm yard and compost manures. The results carried conviction to the ryots.

Trial plots.—Thirty-one trial plots were arranged during the year; 12 on paddy varieties, 5 on cotton, 8 on tobacco, 4 on poudrette as a manure and 2 on wheat rust. Paddy trials were of Pattambi II crop, Ptb. 3, 4 and 6 strains in South Kanara and Cannanore and the results in 9 out of 12 trials were unfavourable as the strains were of longer duration. Poudrette trials in Calicut showed better yield over the controls. All the cotton trials were failures. Virginia tobacco tried in 8 centres of Kasaragod taluk came up well and has created a good impression among the ryots. The produce is under examination. The wheat rust trials in Ernad made for the Government Mycologist showed no rust.

Work in the Islands.—Maistris stationed in the islands worked under the Amins and were given instructions and guidance.

Joint work with co-operative and other departments.—Fourteen co-operative societies were doing non-credit work in the circle. The Kotekar Agricultural and Rural Uplift Work Society, Sugarcane Growers' Purchase and Sale Society and Gokuldas Farm (Poultry and Livestock) in Mangalore, Co-operative Sugarcane Growers' Union in Udipi, Mahali Prevention Co-operative Society, Puttur, and the Palghat Co-operative Union received departmental advice and guidance and have done good work. Special mention may be made of the seed distribution done and the rural exhibition held under the auspices of the Tritala Co-operative Union. Four loan and sale societies continued to function during the year. The arecanut sale effected through the Mangalore Society was pretty large. It is proposed to make use of some of the existing co-operative organizations for rapid seed multiplication and distribution work in particular apart from the introduction of other agricultural improvements.

Jamabandi camps and health week celebrations were utilized to do propaganda work.

The District Economic Councils continued to function till November 1937. The District Officers' Conference called by the Collector after the abolition of the Economic Councils did not meet during the year. The Government of India grant can hardly become helpful to the economic advance of the farmer unless the scope of

the Government Order is expanded to include into it the agricultural regeneration as an item of work at least by way of awarding prizes for best work done by the ryots.

Agricultural Associations.—Palghat Agricultural Association helped the Tritala Co-operative Organization with a grant of Rs. 25 for the conduct of the rural exhibition. This association also rendered financial aid to the poor ryots of Palghat division to purchase green manure seed. They have purchased three young breeding bulls which are carefully maintained to become fit for service.

Exhibition and shows.—Seven large and 34 small exhibitions and 15 shows were held during the year. The stalls kept by the department at the Fifth Mangalore Flower and Vegetable Show, Fourth All-India Khadi and Swedeshi Exhibition at Calicut, the Political Conference Exhibitions at Moolky, the Second All-India Swedeshi Exhibition at Jagannath temple, Tellicherry, Puthur Dasara Exhibition and the Tritala Rural Exhibition attracted good crowds. Gold medals and certificates of merit were awarded to the departmental exhibits. Tritala Rural Exhibition was the first of its kind wherein prizes were awarded to crops judged in the field, the improved methods adopted in manure conservation in particular and products exhibited by the farmer. Associated with it was a show of cottage industries, cattle show, baby show with lectures on subjects relating to health, co-operation, veterinary and agriculture including marketing by the departmental officers. This has created a sense of healthy competition in a group of villages around and is expected to produce tangible results.

Motor Exhibition Van.—The Van II unit came up to Mangalore but could not be put on road owing to breakdown. It was sold in auction in Mangalore itself.

Livestock.—Great impetus was given to the improvement of livestock by arranging the supply of breeding bulls to applicants and encouraging better feeding and rearing of calves, organizing cattle shows and awarding prizes to the best cattle. Cattle show at Sitanadi is worth special mention. Local bodies and organizations like District Board, South Kanara and Palghat Agricultural Association have kept breeding bulls at stud during the year. Total number of breeding bulls and buffaloes under the premium scheme is 22 as against 13 of the previous year. There were three Government bulls also.

Poultry.—Demand for eggs and birds of improved breeds like the White Leghorn and Rhode Island Red is on the increase. 835 eggs have been supplied for hatching from Hosur and Taliparamba Research Stations. Four poultry houses have been constructed. These two breeds and their crosses have considerably spread in the West Coast. The Devadhar Malabar Reconstruction Trust at Tanur, Tritala and Gopalapuram are also doing good work in poultry improvement.

Apiary.—In most of the exhibitions and shows bee-keeping and honey extraction formed an important item of demonstration. Propaganda work by the demonstrators, the supply of hives and extractors arranged at cheap rate and help rendered in hiving bee colonies have given an impetus to bee-keeping as a cottage industry more than a hobby. 142 bee-hives were supplied during the year and as many wild colonies were hived. 12 demonstrations were conducted with the honey extractor. Desertions of colonies are reported, nevertheless there seems to be a good future for this as a cottage industry in the West Coast.

Loans.—Fifty-six takkavi loans amounting to Rs. 1,094 have been granted during the year for the purchase of sprayers and roll-easy mhote wheels. One more loan was granted by the Tahsildar of Puttur for Rs. 120 for the purchase of sprayers. Last year 37 loans amounting to Rs. 925 were granted.

Publications.—4,774 villagers' calendars and 385 bulletins were sold during the year. A large number of leaflets in demand was also supplied. Short notes and jottings were submitted for publication.

Crop-cutting experiments.—Instructions to repeat the crop-cutting experiments on paddy and sugarcane during 1347 fasli were received too late, and only 11 experiments could be conducted in Coondapoor and Udipi taluks on paddy and sugarcane.

III. Agricultural Research Station, Taliparamba.

Season.—The season was on the whole satisfactory. The hot weather was pretty long due to the late receipt of mango showers. The south-west monsoon was a bit late. The north-east monsoon stopped in November leaving a long dry weather to follow.

Dry land crops were fairly satisfactory. Ginger crop was particularly good giving a net income of over Rs. 150 an acre, while chillies worked out at a profit of Rs. 40. They have spread in the surrounding areas. Sugarcane has followed suit. Dry paddy followed by horsegram and preceded by chillies has been found an economic success when grown in the young coconut plantation giving a net profit of Rs. 11–12–0 per acre. A system of inter-cropping has to be followed up to save the coconut cultivator from the effects of low prices.

Pepper inter-planted with coffee is being watched with interest as also the manurial trials with pepper and the intensive cultivation given to definitely better vines.

Wet land paddy has brought in a net profit of Rs. 45–11–6 and sugarcanes Rs. 160 per acre. A departure has been made of planting sugarcane as a purely dry crop which has successfully survived the long hot weather.

Study of fruits has been started in which mango, cashew, pineapple and plantains have received better attention. The possibilities of citrus fruits, sapota and mangosteen are being investigated. Polyembryony was observed in seedling mangoes.

The Agricultural Research Station has been able to give the following seeds :—

Pepper	2,824	**Cashewnut** ..	96 lb.
Pineapple suckers ..	1,544	**Coffee seedlings** ..	3,195
Ginger	127 lb.	**Paddy**	27,814 lb.
Plantain suckers ..	78	**(including 13,000 lb. issued this season).**	
Tapioca cuttings ..	100		
Sugarcane setts ..	16,090		

Bee-keeping was demonstrated by six active colonies remaining hived at the station. The maximum of 7 lb. 8 oz. of honey was secured from one of the hives.

Five stipendiary and four non-stipendiary students underwent agricultural course during the year. These students were the best of the batches the Research Station ever had.

TELLICHERRY,
10*th May* 1938.

K. UNNIKRISHNA MENON,
Deputy Director of Agriculture, VII Circle.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, VIII CIRCLE, COIMBATORE, FOR THE YEAR 1937–38.

I.—CHARGE.

Sri Y. G. Krishna Rao Nayudu was in charge of the circle till 26th July 1937, on which date, I took over and continued till the end of the year. Late Sri K. T. Bhandari was in charge of Salem division till 12th February 1938, when all of a sudden he died while on camp. I was in additional charge of Salem division until 28th March 1938 when Sri V. T. Subbiah Mudaliyar took over. Sri A. Chinnathambi Pillai, Assistant Director of Agriculture, joined duty on 1st September 1937 as Special Assistant Director of Agriculture for Lower Bhavani Project and continued as Assistant Director of Agriculture, Coimbatore.

2. Sri V. K. Subramania Mudaliyar, continued as Superintendent, Agricultural Research Station, Nanjanad throughout the year.

3. There were eleven Agricultural Demonstrators in Coimbatore district, ten in Salem and two in the Nilgiris district and three farm managers at the Agricultural Research Station, Nanjanad. During the year, the Agricultural Demonstrator, Coonoor, Sri B. Dasappa Malli died.

4. The Business Manager with six Agricultural Demonstrators continued till 17th August 1937 doing duty under the Tiruppur Co-operative Sale Society, in Co. 2 Seed Multiplication scheme financed by the Indian Central Cotton Committee.

5. Two Agricultural Demonstrators posted for Lower Bhavani project experiments at Kugalur joined duty on 1st September 1937.

6. Twenty-one store-keepers at one for each depot were the additional staff sanctioned and appointed this year. They were given the necessary training with departmental transactions and accounts; they kept the depots opened on all days satisfying the ryot public and relieved the demonstrators of their clerical work.

II.—DEMONSTRATION.

(1) *Season and Rainfall.*

In Coimbatore district the average rainfall amounted to 25·77 inches which is 7 inches below sixty-year average. Coimbatore, Udamalpet and Dharapuram taluks recorded only 20 inches and below. The distribution of rain was favourable though insufficient during south-west monsoon. During north-east monsoon, the

rains were recorded in the early part leaving the last four months dry. Irrigation water in wells was consequently insufficient; garden crops, especially cotton and dry cotton suffered.

In Salem, the district average rainfall amounted to 35·57 inches which is 3·85 inches above 10 years' average. Though there was more rainfall, the distribution was not even; the last four months, December to March, were also practically rainless here and the water-supply in wells went down; the area under summer crops was consequently reduced.

In the Nilgiris, district average amounted to 54·56 inches; in Ootacamund it was just the average; in Coonoor it was 67·34 inches, while at Nanjanad, it was 47·64 inches, i.e., 6 inches below average. The season on the whole may be taken as favourable to potato and cereals though ring disease appeared in early crop. There was plague in the district during the year, which kept down the potato price.

(2) *Crops.*

(*a*) Cereals.

1. *Paddy.*—Thirty improved varieties of paddy seeds were distributed; 34,036 lb. of seed were directly sold to ryots. The area sown to this seed is approximately 1,054 acres while the area under natural spread is 50,499 acres. The main distribution of established varieties is in the hands of ryots while our work consists in the issue of seed to selected ryots to maintain purity besides introducing promising new varieties released by the Paddy Specialist. G.E.B. 24 and Coimbatore varieties continue to be popular in tank-fed areas; Adt. 11 and A.E.B. 65 are liked in canal-fed areas.

Among recent introductions, Co. 10, (Gobi Kar selection), is rapidly spreading and the area under it, is a little over 1,000 acres in Arakkankottai channel area. Co. 11, Ayansamba selection, is becoming popular and spreading under Tadapalli channel area. T. 672 and 673 introduced a year ago, to replace Rangoon samba in the upper reaches of Kalingarayan channel in Erode taluk, are very promising and are in seed multiplication stage among growers. Of the kar varieties introduced in Salem district, Adt. 3 and Adt. 4 are popular. Of the Patna varieties, T. 670 is very promising and there is good demand. Cross B.K. 10,905 has done well in Attur and Namakkal taluks; an increased yield of 84% grain and 50% straw is recorded in one plot in Namakkal taluk. Economic planting is another improvement advocated and the area under this is 40,510 acres.

2. *Cholam.*—8,854 lb. of cholam seeds of 15 varieties were distributed during the season. Periamanjal cholam is the most popular variety. Among Millet Specialist's improved varieties, A.S. 1575 has proved best this year. Besides this, ten more

varieties introduced are still giving conflicting results. In order to get conclusive results, these are all now under systematic trials in different tracts with the existing local varieties.

3. *Ragi.*—4,819 lb. of improved varieties of ragi were distributed. H. 22 has proved successful as dry crop in parts of Salem district. Among our departmental varieties, E.C. 593 continues to be popoular and has been successfully raised as dry crop in parts of Salem district. The area under this variety by natural spread is 4,043 acres. Other improved varieties are in trial stage.

4. *Cumbu.*—1,717 lb. of seed consisting of six improved varieties were distributed in the year. Kottapulli cumbu, and Punjab cumbu (P.T. 499) are getting popular wherever introduced and the area under these is 421 acres; others are under trial.

5. *Tenai.*—One hundred and twenty-seven pounds of seed of three improved varieties were distributed; S.I. 523 continues to be the best.

6. *Bengalgram.*—Nos. 468 and 482 are the two improved varieties selected for distribution. 2,305 lb. of seed were distributed in the year. 64 acres were sown to these varieties by ryots themselves. 30 lb. in each of blackgram and fieldgram are for the first time sown after paddy in wet lands on the lower reaches in Kodumudi firka in order to find out their suitability in the tract.

7. *Wheat.*—250 lb. of wheat seed of Pusa improved varieties were distributed in the year. These varieties are successful only in the Nilgiris district. Buckwheat tried in Nanjanad farm was also successful.

(*b*) Fibres.

1. *Cotton.*—The major work in this circle is the production and distribution of improved varieties of cotton chiefly Co. 2 Cambodia. From 939 acres of Co. 2 seed farm area 146,863 lb. of seed were obtained and distributed to this circle and others directly. Further seed for sowing was made available in this circle by Co. 2 seed multiplication scheme under Tiruppur Co-operative Sale Society, Tiruppur. Besides many of the ginning factories and merchants are following our methods in the production of good seed and their distribution is also having an appreciable effect in maintaining the supply and effecting the spread of Co. 2 seed in this and adjoining circles. Almost the whole area under Cambodia in Coimbatore may safely be taken to be entirely under Co. 2. 174,973 lb. of Co. 2 seed were directly distributed for sowing. 961·50 acres of Co. 2 seed farm is arranged this season and the kapas is being ginned.

2. *Karunganni cotton.*—694 acres of last season seed farm yielded 94,337 lb. of C. 7 seed. 869·68 acres of seed farm are arranged for this season. The total quantity of seed distributed is

124,426 lb. Besides 200 lb. of Uppam seed were distributed on specific indent. In spite of local seed production by seed farm arrangements, the demand for Sattur seed is increasing and many ryots get their supply direct from Sattur.

Other varieties under trial and observation are Co. 920, 1,267 and Uganda crosses and K.P.T. 1. Karunganni. Besides seed distribution, improvements in picking kapas and the advantages of line sowing are demonstrated; the area sown in lines is 15,333 acres.

(*c*) Fodders.

1. Of all the fodder varieties distributed Periamanjal cholam is liked most by ryots and there is always demand for this. 441 lb. of T. 1 and T. 12 cholam seeds and maize seeds were also distributed. 366 lb. of Kolakattai grass seeds and 4,300 slips of Guinea grass were supplied.

2. Lucerne grown as a concentrated green fodder in small plots near irrigation wells, is gaining importance. Seventy pounds of seed were distributed for fresh sowing in addition to over 100 acres standing area of last season. In Udamalpet taluk alone, 180 lb. of seed were directly obtained by ryots and sown.

(*d*) Fruits.

Considerable propaganda was done for introducing more fruit cultivation. The strong wind during south-west monsoon months is considered not quite favourable in Coimbatore district for fruit trees. Salem nurserymen have lost their reputation on account of their indifferent supply. A good deal of demonstration of spraying, pruning and proper manuring is being carried on. 2,040 fruit plants were obtained and distributed; of these, mangoes are 1,035, oranges 320 and limes 371.

(*e*) Vegetables.

Potato improvement is the main work in the Nilgiris district; 4,147 maunds of seed material were distributed to ryots in Ootacamund and Coonoor. "Great Scot" is the seed largely distributed. The acre yields were satisfactory in general ranging from 630 to 750 maunds for early crop, 650 to 860 maunds for main crop and 645 to 760 maunds for the second crop for the district. Apart from good seed, selection of seed material, proper planting, manuring of the crop and handling of produce for the market were also demonstrated. The demand for departmental seed is always great. The natural spread is estimated at 17,040 acres for the district. The Agricultural Demonstrator, Ootacamund has designed a hand operated fertiliser distributor, which distributes fertiliser quickly and evenly without wastage. 80 maunds of seed material were also distributed in Salem.

Bellary onion is another vegetable in Coimbatore and Salem districts which is finding favour with ryots. 331 lb. of seed were distributed departmentally besides the quantity purchased directly by ryots. Marketing facilities will encourage further spread.

(*f*) Sugarcane.

508,270 setts of improved varieties were distributed in the year. Co. 213 is considered most suitable in garden lands, where there is scarcity of water. Eight thick cane varieties are also introduced in channel-fed fertile areas. Co. 413, 419 and 421 have so far proved heavy yielders recording over 80 tons of cane per acre. The area under several improved varieties is estimated to be 4,686 acres. Other improvements such as selection of disease free setts, trench planting and improved furnace are being demonstrated. Cream jaggery preparation was demonstrated in 19 places.

(*g*) Oil seeds.

1,478 lb. of A.H. 25 groundnut pods (improved variety) were distributed in the year. The yield is considered fair and the pods are big. Most of the seed produced is reserved for sowing among growers; 9,600 lb. of growers' seed were sold outside the circle and 3,000 lb. were purchased for circle distribution. The total area including natural spread under this variety is 678 acres. 1,241 coconut seed nuts were obtained from Malabar and distributed.

(3) *Implements.*

2,512 demonstrations with improved implements were conducted in ryots' fields; of these, 1,360 are with ploughs, 437 with cultivators, 16 with mechanical seed drill, 564 with other implements and 135 with turmeric polisher. As a result, 612 implements were sold including 423 improved ploughs; 948 plough parts were sold. The sale of spare parts in Pollachi taluk alone is 276 valued at Rs. 112 which is an indication that ploughs are fully worked. Research Engineer's improved light drill was successfully demonstrated in Coimbatore for sowing cholam.

(4) *Manures.*

Propaganda on conservation of farm yard manure was continued. 537 manure pits were opened; dry earth system was introduced in 166 cattle-sheds and conservation of urine in 95 places; 16 compost pits and 4 pits where proper collection and preservation of municipal rubbish were demonstrated; 1,180 manure pits were covered with earth.

19,117 lb. of green manure seeds were sold in the year. Besides 16,500 lb. of green manure seeds were sold by merchants. The importance of liming for soil improvement in the Nilgiris was

demonstrated this year successfully in 13 acres among 38 potato growers. The growers appreciate this and are already beginning to follow the practice without our aid. Trials of various manure mixtures sold to potato growers were also laid out to find out the merits of these fertilizers and to appraise the growers of their value.

(5) *Pests and diseases.*

333 demonstrations of spraying, dusting and pruning were carried on to control pests and diseases. Ryots are readily seeking our advice and following remedial measures suggested. Five sprayers and a secatuer were bought by ryots. 248 lb. of sulphur packets, 187½ lb. of fish oil soap, 3 lb. in each of copper sulphate and ceresan and 1½ lb. of calcium arsenate were distributed. Six demonstrations of ceresan treatment against foot-rot in paddy were conducted.

(6) *Pest Act.*

The work of eradication of cambodia and pachanadan cottons before 1st September 1937 was satisfactory in all the tracts owing to favourable rains which enabled the ryots to pull them out easily. There were 87 defaulters, who pulled out their crop before 10th September 1937 and so were let off with warning. In the eight villages of exempted area in the Anamalai tract, extension of time till 22nd October 1937, was given by the Collector as per provision in the Act. However, they allowed the crop till 2nd November 1937 in 60 acres and the defaulters were warned. In ten villages of Coimbatore taluk opposite to the Palghat gap, Cambodia cotton sown early in August was allowed to stand as it would otherwise be hardship and these villagers are permitted, by an amendment of the Act, to sow their crop early in August in view of early rains on condition they pull out the crop early in June.

(7) *Trial plots.*

During the year under report 186 trial plots were laid out. Of these, some are due for harvest in 1938–39 while in some others (sugarcane and cotton) harvest is in progress. The outstanding features in these trials are summarised below. *Paddy* T. 670, 10,905 B.K. 10,783 B.K. and Adt. 798 have done well in Mettupalayam and Salem district. *Cholam* (irrigated) strains in white cholam tried have not given convincingly satisfactory results. *Ragi*—New strain E.C. 3,517 shows promise but requires further trial. *Cumbu*—M.S.P.T. 2,229 (Kottapulli cumbu) has done very well and is taken on for demonstration. Wheat —Pusa 111 has done well in Ootacamund. In the case of cambodia strain, 920 has done well with but few exceptions. The new Uganda Co. 2 hybrid cultures show great promise in so far as they are very early and yield finer quality cotton. At Salem, Sugarcane Co. 417, Co. 419 and P.O.J. 2,878 have done very well.

(8) *Demonstration plots and centres.*

There were 175 centres of work. In these 1,002 demonstration plots were laid out, to show various items of improvements like improved strains or varieties of crops (paddy, cholam, ragi, cumbu, tenai, bengalgram, cotton, groundnut, and sugarcane), use of iron ploughs and other labour-saving implements (ridge plough, guntakas, etc.), economic planting of paddy, seed treatment against fungoid diseases, spraying against pests and diseases, use of cattle manure preserved carefully in pits against heap manure, superphosphate in conjunction with municipal rubbish and fertilisers for top-dressing crops like paddy, sugarcane, tobacco, onions, chillies, etc.

(9) *Work with other departments.*

Crop cutting experiments were done in co-operation with Revenue department. Pest Act to pull out cambodia cotton was enforced in Coimbatore and Salem districts with the help of Revenue department. I was a member of District Economic Councils of Coimbatore and the Nilgiris districts as long as they were in existence.

The Lower Bhavani project irrigation experiments in second crop area at Kugalur were carried out with the Public Works Department from September 1937, for the third year. In addition to the experimental area water was allowed for irrigation to 490 acres under the extension area of the experimental channel. In the experimental area, cholam was sown on 47·67 acres and gave an average acre yield of 57 lb. of grain and 2,390 lb. of straw. The crop received no channel water and matured with the help of 11·67 inches of rainfall received during the period. Cotton occupied 40·67 acres and yielded 539 lb. of kapas per acre. Water consumed is 15·86 inches of channel water in addition to 11·67 inches of rainfall. Vedai ragi was raised on 9·83 acres and yielded 465 lb. of grain and 812 lb. of straw per acre. 14·03 acres of ragi planted after harvest of cholam, gave an acre yield of 332 lb. of grain and 550 lb. of straw. Water consumed is 13·37 inches exclusive of useful rainfall of 0·14 inches. In the extension area, cotton was sown on 411 acres out of 490 acres and gave an estimated yield of 500 lb. of kapas per acre. A separate report on the experiments will be sent later on.

In the matter of Co. 2 seed production and distribution, help was given to the Tiruppur Co-operative Sale Society, besides the staff lent by the Indian Central Cotton Committee till 17th August 1937. A departmental subordinate is lent to this scheme this year to help the society in ginning kapas and selecting seed for sowing.

Advice was also given to Idigarai Agricultural Association, Sugarcane Growers' Association, Coimbatore and to 6 societies in Salem district in their work.

Tiruppur Market Committee.—During the year under report, there were 8 meetings of the Committee. The Committee made arrangements to publish daily market reports and the first report was published on 5th March 1937. The report is published in two parts, one in the morning at 5 a.m. and the other in the evening by 5 p.m. The morning report contains the prices of cotton in New York, Liverpool and Bombay. The opinion of the market, the statistical information maintained in the office of the Committee, the daily purchases and sales in Tiruppur with rates and the opening prices in Bombay and Liverpool are published in the evening report. During the year licences under section 4 were granted to 70, 109 to buyers and sellers, 9 to buyers only, 9 to sellers only, 27 to brokers and 57 to weighmen.

Only one dispute was referred to the Committee for arbitration. The parties agreed for a settlement of the dispute outside. An agreement was reached and the arbitrators recorded it in the register kept for the purpose.

The Homes Cotton Market, where the office of the Tiruppur Cotton Market Committee is situated, is about 12 acres in extent. The Committee decided to purchase the market from the municipality for Rs. 60,000. The Government passed orders approving the price. The Committee has applied to the Government for a loan of Rs. 60,000 for the purchase.

The main object with which the Committee was constituted was to help the grower to market profitably. So far no grower has utilized the services of the Committee except by way of benefits derived from the market intelligence, controlled weighment and regulated trade allowances If the Committee purchases the premises, puts up godowns, provides accommodation for men, cattle and carts, growers will be attracted to make use of the yard. When growers are given all the facilities which they now get in licensed godowns, the Committee will serve the purpose for which it was started. Along with this, outside godowns should be discouraged as far as possible so that all the growers are attracted to the yard. This will enhance the importance of the Committee and the yard.

(10) *Exhibitions.*

43 exhibitions and shows were conducted in the year. 130 lectures with and without magic lantern shows were delivered.

(11) *Livestock.*

One hundred bulls were at stud during the year; of these, 68 are under district board scheme; 29 form premium bulls owned by private bodies and 3 are Scindhe bulls loaned by department to central jails and milk society. The demand for district board bulls under the district board scheme is great and ryots appreciate the scheme

(12) *Loans.*

75 loan applications were disposed off; Rs. 646 were disbursed as takkavi loan to 75 ryots for purchase of implements, 28 Cooper No. 11 and 25 Cooper No. 26 ploughs, 27 mhote wheels, 8 wooden beams and 8 spares were the materials purchased for the loan amount.

(13) *Publications.*

1,654 villagers' calendars and 146 other publications were sold; large number of leaflets were distributed free.

III.—Agricultural Research Station, Nanjanad.

1. *Season.*—The total rainfall recorded was 47·64 inches on 166 days against 57·12 inches on 148 days average for the past twenty years. The season was favourable for potatoes and samai.

2. *Potato.*—As usual, three crops were grown; the irrigated crop over 3·06 acres, the main crop over 8·46 acres and the second crop over 8·73 acres. They gave 464 maunds, 572 maunds and 549 maunds respectively per acre. (1 maund equals 25 lb.)

3. *Samai.*—21·55 acres were grown under this crop and the average yield was 503 lb. of grain and 2,207 lb. of straw per acre.

4. *Barley.*—The crop was sown over 0·84 acres and gave 1,288 lb. of grain per acre.

5. *Resistant oats.*—2·11 acres were sown under this crop in two different months. The late sown crop of June gave satisfactory yield of straw and grain. The former gave 61 lb. of grain and 4,584 lb. of straw and the latter 85 lb. of grain and 1,459 lb. of straw per acre.

6. *Trial crops.*—Buck wheat was grown successfully.

7. *Seed distribution.*—During the year, 3,766 maunds of seed potato tubers, 138 lb. of samai, 392 lb. of lupin, 19 lb. of barley, 6 lb. of oats, 7 lb. of buck wheat were supplied from the station.

8. *Petty construction and repairs.*—A combined cattle-food grinding room and manure pit was built at a cost of Rs. 715. A sheep-shed was constructed for Rs. 715. Improvements and annual repairs to non-residential buildings cost Rs. 945. The Public Works Department executed construction of flush-out latrines and underground drains to the residential quarters.

Coimbatore,
29th April 1938.

C. RAMASWAMI,
Deputy Director of Agriculture, VIII Circle.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, LIVESTOCK, HOSUR CATTLE FARM P.O. FOR 1937-38.

Mr. R. W. Littlewood was away on leave for 13 days in May 1937 and I was in additional charge. He was in charge of the section up to 14th September 1937 when he proceeded on long leave out of India. I took charge from him on the afternoon of the same day and continued to be in charge till the end of the year. Sri A. Gopalakrishnayya was in additional charge for 12 days in February 1938 when I was away on leave on medical certificate.

Mr. Littlewood visited Madras Veterinary College and the Ongole tract for about 6 days in May and 9 days in June in connexion with the Pedigree Herd Book work of the Ongole Cattle and sent the details to the Secretary, Imperial Council of Agricultural Research. He also attended the sub-committee meeting of the District Economic Council held at Anchetty in June and the College-day Conference at the Agricultural College, Coimbatore, in July. He made a round of tours in the West Coast inspecting breeding bulls, goats and poultry and visited Taliparamba Agricultural Research Station in connexion with the proposed starting of a goat farm there. He visited Bangalore twice in connexion with the purchase of breeding buffalo bull calves from the Imperial Dairy Expert.

I visited Tirupati and Tirumalai Devasthanam twice for drawing up a scheme for starting a dairy farm for meeting the demands of the devasthanam. In this connexion I inspected the Chamala Reserve forest area as well. I attended the Cattle Committee meeting at New Delhi in November 1937 and the Dairy Committee in March 1938. I was permitted to visit officially the following places by the Government in November 1937 :—

Etah Goat Breeding Farm, Etah, and
The United Provinces Poultry Institute, Lucknow.

I visited Bangalore twice for purchase of buffalo bulls and for arranging exhibits with the Imperial Dairy Expert for the Madras Swadeshi Exhibition in December 1937.

I visited the Kalahasti Farm once and gave instructions to the Farm Manager in charge of poultry work. In December I toured the West Coast inspecting bulls, goats, poultry and cattle in grazing areas and cattle fairs. In this connexion I visited Pattambi, Calicut, Badagara, Tellicherry, Cannanore, Kanai and Payyanur. I attended a meeting of the Presidents of

District Boards of Erode and Coimbatore and the Deputy Director of Agriculture, VIII Circle, held at Coimbatore in connexion with the work bull and milch schemes on hand and attended the Cattle Show at Valparai, judging cattle and the exhibition at Madras.

At the instance of the Sub-Collector, Hosur, I assisted him to purchase suitable bulls for the Anchetty Cattle Breeding Society at Chenchunkattai in January. As there were not good enough bulls for this station, I attended another fair at Mudukatore and purchased two bulls. I visited Palayakottai once for selecting animals for the All-India Cattle Show and again for the purchase of Kangayam Breeding bulls for this farm.

In February 1938, I visited Hospet and Bellary to discuss with the President of the Karnatak Kurubar Sangham and formulated a scheme for sheep breeding. I also visited Nandyal for inspecting a suitable area for a cattle breeding farm.

Livestock.—The total head of stock under my control at the end of the year was 713 as detailed below :—

Breed.	Cows and heifers.	Stud bulls and young bulls.	Calves.		Work cattle.	Total.
			Heifers.	Bulls.		
Kangyams ..	186	75 *	35	34	27	357
Ongoles ..	..	..	..	..	11	11
Sinds	109	39	13	15	2	178
Crossbreds ..	41	26	7	8	14	96
Hallikars ..	36	15	6	6	..	63
Buffaloes ..	..	1	..	..	2	3
Horses and Mules.	..	..	..	..	5	5
Total ..	372	156	61	63	61	713

* Seventy-five Kangayam bulls include bull Nos. 211 and 142 at the Agricultural Research Station, Koilpatti and Kangayam bulls Nos. 120 and 183 at the Cotton Breeding Station, Coimbatore.

Crossbred herd.—All the cows and heifers in this herd are mated to Sind bulls in order to breed back to the indigenous breed. Cows in milk are transferred to the Agricultural College Dairy, Coimbatore. Some dry stock, heifers and bull calves are transferred to Hosur for rearing. Some of the 7/8th and 3/4th Sind graded bulls are suitable for stud purposes on the West Coast and urban centres where milk is the chief object. Some of the bulls and heifers resemble the Sind and it is difficult to distinguish them.

At Hosur there were 78 breeding stock at the beginning of the year. There were 10 births (4 heifers and 6 bulls), 10 cows, 1 heifer, 4 heifer calves and 2 bull calves were received from the Agricultural College Diary, Coimbatore. Four cows and five heifers were sold, one bull was issued in exchange to the Coimbatore District Board, one bull was transferred to work cattle, 11 cows were issued to the Agricultural College Dairy, Coimbatore, and 1 heifer calf died. The balance at the end of the year was 82 breeding stock.

There were on an average 7·7 cows in milk as against 6·02 cows of last year. Their daily average milk yield was 10·9 lb. as against 13·3 lb. of the previous year.

At the Agricultural College Dairy, Coimbatore, there were on an average 20·6 cows in milk giving a daily average milk yield of 14·3 lb. per cow.

The best yielders in the herd are :—

Cow number.	Milk yield.	Daily average.
	LB.	LB.
323	9,583·2	27·1
348	9,051·4	15·7
361	8,726·9	17·6
333	7,990·5	13·0
319	7,732·6	20·5
321	6,857·9	17·1
337	6,397·5	19·0
299	6,207·9	15·2
263	5,825·7	16·6
258	5,768·6	16·3
352	5,840·2	15·3
358	5,127·4	14·4
287	5,057·9	17·6

Sind herd.—This breed continues to do well and the milk yield is gradually increasing. As it was not possible to meet the demand for them, special arrangements were made to purchase animals from Karachi on behalf of the public.

At the beginning of the year there were 176 animals in the breeding stock. Twenty-nine calves were born (15 bulls and 14 heifers), 3 bulls, 1 cow, 1 heifer, and 1 heifer calf were received from the Agricultural College Dairy. Five cows, 4 heifers, 1 heifer calf, 12 bulls were sold, 4 cows, 1 bull, and 1 heifer calf were transferred to the Agircultural Research Station, Koilpatti, 2 bulls were sent to the Cotton Specialist, Coimbatore, 1 bull suffering from Johne's disease was handed over to the Mysore Civil Veterinary Department for experimental treatment and 2 cows, 1 heifer calf and 1 bull calf died, leaving a balance of 176 breeding stock at the end of the year.

There were on the average 35·7 cows in milk yielding a daily individual average of 11·3 lb. of milk.

Forty-five cows completed their lactations during the year and their performances are classified as below :—

1 cow has yielded above 8,000 lb.
4 cows have yielded between 6,000 and 7,000 lb.
1 cow has yielded between 5,000 and 6,000 lb.
14 cows have yielded between 4,000 and 5,000 lb.
12 Do. do. 3,000 and 4,000 lb.
13 Do. below 3,000 lb.

Most of the farm-bred cows are doing well.

The best performers among the farm-bred cows during the year were :—

Number.				Milk yield.	Daily average.
				LB.	LB.
40	..	..	..	6,686·5	16·9
89	..	..	..	6,152·5	16·7
43	..	..	..	6,083·0	14·8
68	..	..	..	5,552·0	14·4
36	..	..	..	4,846·5	15·1
50	..	..	..	4,804·0	13·8
46	..	..	..	4,705·0	13·8
92	..	..	..	4,678·5	12·2
25	..	..	..	4,638·0	14·2

Kangayam herd.—There were 354 animals in stock including work animals, at the beginning of the year. There were 74 births (37 bulls and 37 heifers), 3 bulls were received for exchange and 3 bulls were purchased. Fourteen cows, 6 heifers, 2 heifer calves, 1 bull calf, 27 bulls and 2 work cattle were sold, 3 bulls were issued in exchange, 6 heifers were transferred to the Government Agricultural Chemist for experiments on nutrition, 1 bull was sent to the Cotton Specialist, Coimbatore, 1 bull was transferred to the Agricultural Research Station, Koilpatti, 2 cows (work cattle) and 1 bull were destroyed, 1 cow and 10 calves died leaving a balance of 357 animals, including work cattle at the end of the year.

There were on an average 61·5 cows in milk throughout the year and their daily average works up to 6·2 lb. as compared with 7·2 lb. of the previous year. Seventy-five cows went dry and their performances are classified below :—

6 cows yielded between 3,000 and 4,000 lb.
17 Do. do. 2,000 and 3,000 lb.
36 Do. do. 1,000 and 2,000 lb.
16 Do. below 1,000 lb.

Particulars of the best performers among the farm-breds are :—

Cow number.				Milk yield.	Daily average.
				LB.	LB.
206	..	..	..	3,715	10·6
244	..	..	..	3,394	9·8
209	..	..	..	3,199	9·7
194	..	..	..	2,977	12·7
171	..	..	..	2,916	8·3
163	..	..	..	2,887	9·3

Hallikar herd.—This herd continues to do well. At the beginning of the year there were 52 animals. Thirteen calves (6 heifers and 7 bulls) were born, 2 stud bulls were purchased, 3 bulls were sold and 1 bull calf died, thus leaving a total of 63 animals.

There were 13·1 cows in milk but none of them were milked.

Buffaloes.—Five bulls were purchased during the year, 1 was sold to the District Agricultural Association, Coimbatore, 1 bull was transferred to the Agricultural Research Station, Koilpatti, and 2 bulls to the Assistant Agricultural Demonstrator, Madras. One young bull is now in stock.

Disposal of stock.—Forty-three bulls were sold (27 Kangayams, 12 Sinds, 3 Hallikars and 1 buffalo bull), 4 bulls (3 Kangayams and 1 crossbred) were issued in exchange for 3 Kangayam bulls received back at Hosur and 1 Sind bull received back at the Agricultural College, Coimbatore, for non-service or slowness in service, and 8 bulls were transferred to other stations (1 Sind, 1 Kangayam and 1 buffalo bull to the Agricultural Research Station, Koilpatti, 2 Sinds and 1 Kangayam to the Cotton Breeding Station, Coimbatore, and 2 buffalo bulls to the Veterinary College, Madras).

Thirty-two cows (9 crossbreds, 9 Sinds and 14 Kangayams), 3 heifer calves (1 Sind and 2 Kangayams) and 1 Kangayam bull calf were sold for breeding purposes.

Fifteen cows and 1 heifer calf (11 crossbreds to the Agricultural College Dairy and 4 Sind cows and 1 heifer calf to the Agricultural Research Station, Koilpatti) were transferred to other stations. In addition, 6 Kangayam heifers were issued to the Government Agricultural Chemist at Coimbatore for animal nutrition experiments on mineral metabolism.

Altogether 53 cows, 4 heifer-calves, 1 bull calf and 55 bulls were issued for breeding purposes.

Bellary sheep.—At the beginning of the year the flock consisted of 78 sheep. There were 48 births, 3 rams were received back from Guntur farm, 8 rams were received from the Government Agricultural Chemist, Coimbatore, 20 rams, 13 ewes and 1 ewe-lamb were sold and 2 ewes were sent to the Principal, Madras Veterinary College, for study regarding Johne's disease and 7 ewes and 8 lambs were either destroyed or died. The strength of the flock at the end of the year was 86.

In the March-April clipping 83 sheep (15 rams and 68 ewes) averaged 1 lb. 3 oz. and in September-October clipping 85 sheep (25 rams and 60 ewes) averaged 1 lb. 12 oz., the average for the year works out to 2 lb. 15 oz.

The best yielders for the year were :—

	LB.	OZ.
Ram No. 78	6	3
Do. 84	5	9
Do. 33	5	8
Ewe No. 113	3	10
Do. 91	3	7
Do. 96	3	5

Pigs.—At the beginning of the year there were 17 pigs; 42 piglings were born, 6 pigs and 23 piglings were sold away, 1 pig and 8 piglings died leaving a balance of 21 at the end of the year. Out of the 29 pigs sold, 26 were for breeding purposes.

Poultry.—Flocks of imported birds of White Leghorns, Rhode Island Reds, Light Sussex and Black Minorcas and an indigenous breed the Chittagong are maintained.

On an average 286 birds were maintained at Hosur throughout the year. Six hundred and sixty-six chicks were hatched out, 26 birds were returned from exhibitions, 6 country hens were purchased, 462 birds were sold, 102 died, 48 were transferred leaving a balance of 385 birds at the end of the year.

On average 78 laying hens throughout the year laid 12,020 eggs with an annual average of 166·9 eggs per bird as against 169·8 eggs of the previous year.

One thousand three hundred and eighty-seven eggs were set for hatching and 666 hatched out. The percentage of hatchability works out to 49·5. Some experiments were started to improve the methods of hatching. The best results with the incubator was 60 per cent and under hens 80 per cent.

Egg record of the pullet year for the years 1932–33 to 1937–38.

Breed.	Average number of eggs laid in years.					
	1932–33.	1933–34.	1934–35.	1935–36.	1936–37.	1937–38.
White Leghorn.	(19) 162	(20) 150	(15) 141	(6) 152	(7) 214	(14) 178
Rhode Island Red.	(4) 154	(17) 124	(12) 167	(12) 183	(14) 186	(6) 164
Light Sussex ..	(9) 123	(6) 116	(12) 134	(3) 170	(7) 154	(8) 153
Black Minorca.	..	(2) 165	(14) 143	(5) 165	(8) 175	(13) 124
Tellicherry ..	(6) 88	(4) 73	(10) 83	(2) 93	(6) 76	(6) 91
Chittagong ..	(3) 122	(4) 138	(5) 127	(4) 113	(2) 162	(2) 128

NOTE.—Figures within brackets indicate number of pullets.

Highest individual yields of pullets in the year :—

Breed.	Pullet number.	Eggs laid.
White Leghorns	447	248
Rhode Island Reds	455	269
Light Sussex	477	188
Black Minorca	430	220
Tellicherry	777	109
Chittagong	786	188

Particulars of birds maintained at the Government Agricultural Research Stations.

Stations.			Average number maintained including chickens.	Number of eggs laid.	Chickens hatched.	Eggs sold for hatching.	Birds sold and transferred.
Hosur ..	..	..	286	12,020	666	2,627	510
Palur ..	..	..	111	3,522	154	420	151
Coimbatore	..	..	180	8,915	291	1,323	157
Samalkot	..	..	67	1,756	110	286	87
Aduturai	..	..	134	6,965	117	848	81

No poultry work was done at Kalahasti in 1937–38. At Anakapalle, after the loss of almost all the birds last year, the work has just started. At Pattambi and Taliparamba poultry work was started in 1937–38 and detailed figures are not available.

Breeding bulls at stud.—Grants of 90 rupees per annum are given for the maintenance of breeding bulls approved by the department in the districts and Rs. 10 in prizes for the best calves born to the bulls during the year.

In the case of district boards a grant of Rs. 100 per annum per bull is contributed as subsidy towards purchase and maintenance of breeding bulls in their districts; Coimbatore, Tanjore and Villupuram District Boards are in the scheme. The working of this scheme is supervised by the Deputy Directors of the respective districts and details are not therefore available in this office.

At the end of the year there were 165 stud-bulls in the districts getting the annual premium of Rs. 90. During the year 96 new bulls were included in the premium scheme. These figures do not include the district board bulls subsidized by Government.

The number of approved breeding bulls maintained in the Presidency, excluding the district board bulls, are as follows :—

Premium bulls	165
Bulls in Veterinary Hospitals	15
Stud bulls in Agricultural Research Stations.	24
Stud bulls stationed in jails	3
Bulls loaned to Public Bodies	5
Total ..	212

Livestock Research Station, Hosur.—The number of stock at the end of the year was 713. The farm was not able to meet the demand for bulls of the three breeds maintained. The first lot of Hallikar bulls were sold to the Anchetti Cattle Breeding Association.

The rainfall for the year was 27·45 inches which is below the average and there is scarcity of water on the farm. But for the well in the Karanoor tank-bed, arrangements should have been made already to get water from elsewhere. The grazing became

poor towards the end of the year and large quantities of silage are being utilized. The average yield of hay is 1,143 lb. per acre this year which is much less than last year.

On an average there were 106 cows in milk throughout the year and they yielded 318,962 lb. of milk with a daily individual average of 8·3 lb. as compared with 9·2 lb. of the previous year.

One thousand three hundred and seventy-one cases were treated at the Veterinary hospital and there was a severe outbreak of Foot and Mouth disease among the cattle in April 1937. Four hundred head were protected against blackquarter and 227 fowls were vaccinated against fowl-pox. Out of 22 cases suspected for Johne's disease, 5 proved positive. Some sheep were also suspected and segregated.

Cattle Breeding Station, Lam, Guntur.—This continued to be under the control of the Deputy Director of Agriculture, II Circle, and it will come under my direct charge as soon as this section is transferred to the Veterinary department on the 1st April 1938.

The Madras City Breeding Bulls Scheme.—The Assistant Agricultural Demonstrator, Livestock, continued to be under the control of the Deputy Director of Agriculture, IV Circle, till the end of 31st March 1938. Eight bulls (consisting of 1 Ongole, 1 Sind, 1 Ayrshire, 1 Crossbred and 4 buffalo bulls) are maintained at the Veterinary College, Madras, for the use of Madras milkmen and private cow-keepers. The total number of services performed during the year was 593 as against 726 for the previous year. The receipts by way of fees amount to Rs. 719–14–0.

The demonstrator, in addition to being in charge of bulls, has been inspecting calves and inspecting the General Hospital Dairy giving advice to milkmen with regard to better rearing of calves, clean milking and better feeding. He reports that the milkmen are finding it extremely difficult to carry on with their business and that some of them have given up the profession.

Publications.—My paper "The situation in India with regard to milk supply to cities" submitted to the World's Dairy Congress at Berlin in 1937, was accepted and published.

T. MURARI,
Deputy Director of Agriculture, Livestock.

HOSUR CATTLE FARM P.O.,
5th May 1938.

ADMINISTRATION REPORT OF THE GOVERNMENT AGRICULTURAL CHEMIST, COIMBATORE, FOR THE YEAR 1937–38.

I was in charge of the office of the Government Agricutural Chemist, throughout the year and held additional charge of the post of Assistant Agricultural Chemist, Malting, from 13th May 1937 to 11th November 1937, and of the post of Agricultural Bacteriologist from 4th January 1938 to end of March 1938, in the absence on leave of those officers.

2. The work of the section is as in past years divisible under two main branches—(i) Advisory and (ii) Research.

The work under Advisory consisted in the analysis of samples received and advice rendered in matters connected with the chemistry of soils, manures, foodstuffs and fodders, water for irrigation purposes, human foods from jails and hospitals, and other agricultural products. These services were availed of by the public and members of the Agricultural and other Government departments.

The Research work, conducted, was on original investigations on Soil Science, Bio-Chemistry of plants and animals and in the agricultural industries like jaggery making and the malting of cholam.

The conduct of soil surveys, on behalf of the Irrigation branch of the Public Works Department, of the commands of proposed projects, which have been a feature of work of the section for the past three years, continued to engage attention and the command of the Gundlakamma Project in the Ongole taluk of the Guntur district was surveyed and work completed during the year under report.

I.—Analytical and Advisory Work.

The number of samples received during the year totalled 2,145, and with 673 carried over from the previous year, totalled 2,818, against 2,155 for the previous year. Of these samples 2,544 samples were analysed and reported on, leaving a balance of 274 carried forward. These numbers do not include the 396 samples of soil collected during the course of the Gundlakamma Soil Survey, which were analysed during the year. The samples received from the officers of the Agricultural department numbered 1,496; 225 samples were received from other Government departments, i.e., Jail, Veterinary, Industries and Irrigation departments. Samples from private parties including bona fide ryots numbered 28, and those from the United Planters' Association of South India 9. This year, arrangements were made to analyse samples for the Coorg Administration, at their request,

and one sample was so analysed and reported on, the fee for analysis being paid at the usual scheduled rate. The rest of the samples were from investigations in progress and routine work for the Agricultural department.

A sum of Rs. 370–8–0, made of Rs. 121–8–0 from the United Planters' Association of Southern India and Rs. 249 from private parties was collected as analytical fee and remitted into the treasury. The corresponding amount for the previous year (1936–37) was Rs. 579–8–0 and Rs. 619 in 1935–36.

II.—RESEARCH.

3. *Gundlakamma Project Soil Survey.*—This soil survey was undertaken at the instance of the Irrigation department, to examine the soils of the command for a wet scheme before work on the project is decided upon. Special staff was appointed for the purpose and work in the field and laboratory completed during the year under report. As anticipated by the preliminary traverse, the soils of the head end of the command was of high fertility, while those near the sea-shore were saline and almost unfit for cultivation. The soil in general was alluvial soil, with a probable origin in the black soil of the Deccan area, and had no marked profile characters except a scattered distribution of gypsum crystals almost throughout the profile. The water of the Gundlakamma was also studied for its salt content, by samples drawn at Tangiralla and revealed that it was water of fair quality and not likely to be injurious when applied for irrigation. In general the project area is a promising one for a wet scheme. A detailed report is being submitted separately.

4. *Kattalai high-level channel project.*—Work on the reclamation of alkaline land in the Kulitalai taluk of the Trichinopoly district was started with a set of plots at Mettumarudur village in the midst of a very bad area. Various treatments, i.e., application of sulphur, gypsum, and mere washing out by water were tried. It was found that gypsum applied at a rate of 10 tons per acre was the most effective, as the carbonate content was reduced to almost nothing and the drainage improved by change in the physical condition of the soil. Work is in progress in the field. Work done in pots with soil from the same village gave similar results and it was found possible to raise paddy in those soils under laboratory conditions after sulphur and gypsum treatment.

A.—Soils.

5. *Study of the origin of soil.*—The work done last year was continued and the soils from a number of profiles both from irrigated and unirrigated areas of the Tungabhadra command were examined. The separation of the clay fraction in the soil of each horizon was carried out. It was seen that SiO_2/R_2O_3 molar ratio showed very uniform values in all the horizons of each profile and that the irrigated and dry soils did not vary in their value among themselves. This finding is of great importance in

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showing that the soil in all its horizons is a homogenous one and not made up of different layers as would be the case as the black soil was of transported origin, and that it had been found *in situ*, and secondly that the soil complex is a very highly stable system, not having been changed by continuous irrigation. Again the results of the analysis of the clay fraction have shown in no uncertain manner that the black soil is an entity by itself, and could not have been derived from any other type, but that it was formed from parent rock of a specific minerological composition. Work is in progress on this problem.

6. *Effect of irrigation on black soil.*—Work on this problem was started at Siruguppa. The site of 90 acres selected last year was laid out and buildings were erected, and preliminary work started during the year under report. The work in progress there is divided into two branches, (i) Agronomic and (ii) Chemical. Under Agronomic, the work consists in the study of the quantity of irrigation water required to successfully raise crops under the conditions prevailing in the tract and a study of new varieties of the main dry crops—cotton and cholam. In addition to this, a variety of garden crops are being tried.

Under chemical work, the effect of irrigation on the movement of salts in the horizons is being studied.

During the year under report, Agronomic work was started by laying out an experiment in Block III of the farm and irrigation applied at different rates and at different intervals. Results so far available have shown marked increase in crop yield as a result of irrigation.

No chemical work was done during the year under report as the laboratory building has not yet been completed.

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B.—Manures and Fertilisers.

7. *Effect of Molasses on paddy.*—The residual effect of molasses on paddy was studied in an experiment for the second time. No effect was seen. This experiment is now being discontinued.

8. *Effluent from the activated sludge plant versus channel water.*—This experiment was repeated this year. The results of harvest showed that effluent water used instead of channel water for irrigation gave a 3 per cent increase of grain but a 40 per cent increase in straw.

The grains from the two sets of plots had different nutritive values—vide paragraph 19 below.

9. *Channel water* versus *sullage water with paddy.*—This experiment was repeated during the year under report. Sullage water diluted with three volumes of ordinary water gave an increased yield of 21 per cent in grain and 64 per cent in straw over channel water. This is in line with the results obtained last year.

10. *Plant nutrition.*—Forty-two samples of plantains of different varieties were analysed, for their food value and mineral content. One of the outstanding varieties was the Red Banana with a total sugar content of 20·9 per cent and a non-reducing sugar content of 13·8 per cent.

C.—Animal Nutrition.

11. *Maintenance requirement of bullocks.*—The concluding series of the experiment was conducted on the minimum protein requirement of Kangayam bullocks. This was determined by adjusting the diet to equate it with the loss in urine and fæces. The requirement as found was confirmatory of the previous work and was in the neighbourhood of 100 grams digestible protein.

12. *Protein metabolism and Muscular work.*—Further work was carried out on this problem, and nine experiments were conducted with the experimental bullocks. The quantity of work was given at three levels, i.e., 4 hours, 6 hours and 8 hours and the requirement of protein required for these three levels was determined. It was seen that (i) the protein requirement increased with the quantity of work performed, (ii) the additional quantity of protein required, though not proportional to the increase in quantity of work, was a linear function of the quantity of work, (iii) the product of the breakdown of tissues was excreted in the urine wholly as urea plus ammonia. Final proof has now been obtained on the question of increased protein metabolism as a result of muscular work.

13. *Mineral metabolism of dairy stock.*—The experiment of the previous years was continued. The crossbred heifers reached maturity and were pregnant and calved towards the end of the year.

Six fresh Kangayam heifer calves were obtained in July and put on to the experimental routine and were under experiment after being accustomed to the routine. The crossbred heifers during pregnancy showed a steady requirement of calcium and phosphoric acid, which increased sharply after parturition and when they began to yield milk. In the Kangayam heifers the requirement was of the same order as that of the crossbred heifers when they were at the same stage of growth.

14. *Blood test for mineral deficiency.*—This work was continued from last year and blood samples taken from the Kangayam calves, and from animals at Anakapalle and Hosur. The values obtained were all normal values. One case of severe Arthritis in a bullock was studied at Coimbatore and the blood while showing normal values for calcium showed a very low value for phosphoric acid.

15. *Mineral content of pasture.*—Fifty-six samples of grasses from the hilly region near Coimbatore, Palayakottai in the Kangayam tract, the Guntur Agricultural Research Station and the Palnad and Vinukonda taluks of Guntur district, were analysed in connexion with the pasture survey.

The hill grasses in general had a low mineral content, while those of the Kangayam area were of very good composition, and those from the Agricultural Research Station, Guntur, were of good quality. The samples drawn in the hilly region of the Palnad and Vinukonda taluks of the Guntur district showed great variation, ranging from grasses with a high mineral content grown on the " Beedu " lands (private grazing lands) of the low lands to very deficient grasses grown in the forest areas. The species were all indigenous ones.

16. *Manurial experiments on pasture.*—The plots on which Kollukattai and Rhode grass was sown in the animal nutrition grounds at Coimbatore were studied for response to manuring. The application of ammonium sulphate raised the protein content of both the grasses, while cattle manure had no appreciable effect on composition over the control plots.

17. *Poultry nutrition.*—The effect of diet on flesh and egg quality was studied. One group of birds received a diet containing fish meal while the other was fed with a diet containing groundnut cake protein. The egg and flesh of the birds of both groups on analysis showed a differential make up of the protein, the fish meal group, egg and flesh containing more of the amide fraction.

18. *Sulphur metabolism of sheep.*—Preliminary experiments on the bacterial flora of the sheep rumen indicated that the conversion of sulphur into sulphate form was due to bacteria in the intestinal tract of the sheep. This is in line with the work done on the metabolism of sulphur by sheep in which the sulphur fed was excreted largely as sulphate sulphur in the urine. The site of storage of sulphur in the sheep is yet to be investigated.

19. *Biological value of protein of cereals.*—The biological value of the protein of cereals grown under differential manurial treatment were determined. The grains were grown on the old and new permanent manurial plots of the Central Farm, Coimbatore. The crops experimented on were ragi and cholam from the old permanent manurial and panivaragu and ragi from the new permanent manurials. In the case of the old permanent manurial grains cattle manure grains had a higher biological value than the " No manure " and " Mineral manure " grains. In the case of the new permanent manurial grains, " Cattle manured " grains did not show this superiority.

Biological value of rice grown with effluent water and channel water—vide paragraph 8 supra.

The rice grown with effluent water had a protein content of 10·40 per cent and that with channel water 7·60 per cent. When fed to rats, the biological value worked at 88 per cent and 89 per cent, but in the net protein value the effluent water rice had the higher value of 8·29 per cent against 6·39 per cent for channel water rice. It is clearly seen that nutrition of the rice plant influences its quality.

D.—Microbiology.

20. *Azotobactor inoculation of cereals.*—The method of inoculating cereals before sowing by steeping in a culture of Azotobactor was tried on the field scale. The method gave positive results with ragi, there being an increase in yield of grain and straw. With wheat there was no increase and the data was not statistically significant.

21. *Legume nodule work.*—The investigation of the nodule bacteria of Indian legumes was continued and cross inoculation studies were carried out with Sesbania Grandiflora (Agathi) and Sesbania Speciosa with all the known bacterial plant groups. It was seen that these two host plants could be classified under the Dhaincha bacterial plant group.

22. *Studies on the keeping quality of milk.*—The keeping quality of milk obtained from the College Dairy and outside on boiling was studied in 17 experiments during the year. The results obtained may be summarized as follows :—

(i) Boiling the milk for five minutes destroys most bacteria —even those of highly contaminated milk, this is particularly the case with B coli.

(ii) The multiplication of bacteria on keeping the boiled milk is at a very low rate for the first three hours and then comparatively rapid, reaching a peak during the 6th to 9th hour. The old South Indian practice of boiling milk for keeping is thus shown to be a safe one.

E.—Sugarcane and Sugarcane Products.

23. *Studies on jaggery.*—A study was undertaken on the physico-chemical properties of jaggery in relation to quality and keeping quality. Seventy-two specimens of jaggery were prepared at Anakapalle from canes grown under different treatments and from different varieties of cane, and subject to a detailed study. Jaggeries are classified under the two heads of "good" and "bad," a classification which is very indefinite and crude. Chemical analysis done does not give any definite ground for classification. There are other factors which take part in determining quality. These studies have shown that jaggeries can be classified as follows based on their internal structure : (i) crystalline and dry, (ii) crystalline and moist, (iii) micro-crystalline and moist. The first class includes the "good" jaggery, the second and third being "medium" and "bad."

24. *Nitrogen content of cane juices and its effect on colour of jaggery.*—Preliminary work has shown that the development in colour during jaggery making, even after filtration, is correlated with the presence of nitrogenous substances in the cane juice. It would appear that the presence of amino groups in the juice cause the development of colour during the boiling of the decolorised juices. This is in line with work done elsewhere on the production of dark coloured substances during the hydrolysis of a protein

by the subtraction of amino groups with aldehyde group. A cane juice with a high nitrogen content gives dark coloured jaggery even after filtration through carbon.

25. *Arrowing of sugarcane.*—The phenomena of arrowing is common in the seedling varieties of cane and is viewed with apprehension by ryots. This problem was taken up during the year, and it was seen that during arrowing, (i) there is a tendency for the cane to produce flowers as the carbon : nitrogen ratio of the top of the cane increases, (ii) the cane begins to dry progressively from the top downwards and (iii) the extraction percentage decreases as a result of arrowing while the sucrose content remains constant.

26. *Maturity of cane.*—The usual tests of a top/bottom ratio approaching unity, high purity and high concentration of sugar are not always valid as criteria of ripeness of cane. Studies have shown that a low glucose and low nitrogen content are better criteria.

27. *Active carbon.*—Active carbon from paddy husk was prepared on a bulk scale and 3,000 lb. so produced. The quantity distributed for departmental officers amounted to 1,500 lb. for demonstration of cream jaggery making.

28. *Jaggery from palm juice.*—A procedure employing the removal of lime from the juice by superphosphate and filtration through active carbon was worked out which gave a satisfactory product free from the characteristic toddy flavour, from palmyrah and coconut juice.

F.—Malting of Cholam.

29. *Keeping quality in vacuum pack.*—Investigation on the keeping quality of cholam malt when packed in vacuum tins showed that no deterioration occurred even after a lapse of six months. The protein content remained constant, while the development of free fatty acids was inappreciable during the period and aroma and flavour of the malt meal was unimpaired.

30. *Bread and biscuit from cholam malt.*—Successful attempts were made to prepare bread and biscuits by blending a fair percentage of cholam malt with white flour. The product was palatable and nutritious, being equal to the imported biscuits and better than ordinary bread.

G.—Miscellaneous.

31. *Citrus disease.*—An investigation was started in collaboration with the Government Mycologist, and the Deputy Director of Agriculture, II Circle, Guntur, on the causes of the disease of citrus in gardens in Patamata and Patamata lanka near Bezwada. It was first supposed that the disease was primarily

due to the contamination of the soil and water by the waste water from tanneries, in the vicinity of the garden. The soil and water of the area were examined and the disease found to be a fungus disease which was present even in gardens far away from the tanneries. It was seen that the disease was associated with a pH. of 8·5. Remedial measures were suggested for soil disinfection and lowering of the alkaline reaction by application of sulphur. The work is in progress.

P. V. RAMIAH,
Government Agricultural Chemist.

ADMINISTRATION REPORT OF THE PADDY SPECIALIST FOR THE YEAR 1937–38.

1. *Charge and staff.*—I continued to be in charge of the section with the two sub-stations at Maruteru and Pattambi which during the year were under the direct charge of Superintendents, Messrs. K. Venkataraman and S. Jobitha Raj, respectively. The two newly opened small Rice Research Stations at Buchireddipalem and Ambasamudram were for technical purposes under my charge though administrative control was under the Circle Officers.

2. *Season.*—The season was unfavourable for the paddy crop at Coimbatore. The total precipitation of 18·71 inches was in defect of the average for the previous 17 years by 6·55 inches. The south-west monsoon broke out in time but was weak and short lived. The north-east monsoon was belated and below average. There was thus a wide break between the two monsoons resulting in the drying up of the tank, during the critical period of the growth of the crop. The average acre yield of 2,000 lb. was very much lower than in the previous year. The season was favourable for paddy at Maruteru. The total rainfall of 35·31 inches was fairly well distributed. At Pattambi, in spite of the fact that the total rain-fall was 12 inches below average, the season was favourable for both the first and second crops.

3. *Seed distribution.*—The total quantity of seed paddy distri-buted to the circle officers and direct sale to ryots from the three stations is as follows :—

Paddy Breeding Station, Coimbatore, 33,254 lb.

Agricultural Research Station, Maruteru, 52,160 lb.

Agricultural Research Station, Pattambi, 59,060 lb.

With the increase in the number of strains released from the stations and proportionate decrease in the quantity of production in each strain, it is found that the stations are unable to meet the demand for improved seed from the Demonstrators. It is time that primary seed farms are managed by each Demonstrator to meet his requirements and indent for just the quantity of seed required for sowing his primary seed farms is made from the stations every year.

4. *Economic work : Evolution of strains*—(*a*) *Strains released for distribution.*—Co. 12, a strain in *Sendinayagam*, the variety grown in the *pishanam season* in Tinnevelly was transferred to Ambasamudram station for multiplication. The incessant demand for an early maturing white rice selection in *vadansamba* from the Chingleput area was met by releasing a bulk quickly obtained by mass selection. It is reported that *vadansamba early* mass bulk has done well for two seasons under trial in the district and it will be under distribution till a pure line selection is made available.

At Maruteru, a strain in each of the two popular varieties *pedha atragada* and *Delhi bhogum* cultivated under the Kistna irrigation is released for distribution as Mtu. 12 (*pedha atragada*) and Mtu. 13 (*Delhi bhogum*). Mtu. 12 *atragada* is locally esteemed for its quality of rice and is suitable for low lying areas in the lower delta. Mtu. 13 is a fine riced selection with a market of its own and is suitable for cultivation in the well drained soils of the higher Kistna delta.

(*b*) *Strains under district trial awaiting release.*—Two hybrid strains 10905 and 10783, possessing high yield and stiff straw isolated from a cross between Co. 3 and a Burma variety were extensively tried in Chingleput, Salem and Trichinopoly under rainfed and swamp conditions. Of the two, 10905 has done better than 10783. Both the strains fared well only where water-supply was adequate and plentiful. In fact, the strains have been reported to have withstood submersion for four days in the Collair area near Kaikalur. Further trials have been programmed in the Collair region.

The three disease resistant strains 10998, 11340 and 11348 isolated from a cross between G.E.B. 24 X *korangusamba* of Tanjore district, the latter susceptible to the disease known as blast (*piricularia oryzæ*), were put to severe test at Coimbatore and Buchireddipalem by growing them under favourable conditions of infection. In both the places the strains were free from the disease, while the local *korangusamba* and *molagolukulu* succumbed very badly to the disease. Though the disease did not appear at Aduturai, Ambasamudram and Palur, yet the strains maintained their usual superiority over the local variety. Even in the district, except in cases where 'surai' (mealy bug) attack in the plots under trial vitiated the results, the strains were promising. It is also interesting to note that in one of the bulk trials in Tanjore district at Tiruvadi, strain 11340, was found to yield well in an alkaline area where only a very indifferent and poor crop was obtained in previous years. Probably the strain has inherited the quality of alkaline resistance from GEB. 24, one of the parents in the cross. Further extensive trials with the strains are programmed in Nellore, Cuddapah and Tanjore.

Two Pattambi strains Ptb. 3 and Ptb. 4 were under trial in South Kanara district for the first time in the second-crop season. Both of them have acquitted well. Ptb. 3 is found to be useful for places where water-supply for the second crop is precarious and Ptb. 4 for places commanding good irrigation facilities.

At Maruteru, two strains of *potti-atragada* that had proved promising in previous trials were again tested both at the station and in the district. As the results of trial proved inconclusive, the strains will be tried again in the next season.

(*c*) *Pure line selections in progress.*—At Coimbatore 56 cultures isolated in *arupathamkodai* of Madura district, and *vellaikar*, *vadansamba* and *sirumani* of Chingleput district have completed

the three years' trial on the station. Those that have been consistently yielding between 10 to 20 per cent over the standard will take their trial in the district. Of the 332 cultures in three of the Chittoor varieties, to wit, *yerra, thella and pulla sannavadlu* that were under preliminary yield trials, 126 cultures were selected for regular yield trials. A second batch of 84 single plant selections in *vadansamba* was also under study. The unfinished selection materials, numbering 1,000 units that were brought with us from Berhampore station were multiplied at Coimbatore and are awaiting their retransfer to the proposed station in North Vizagapatam district.

At Pattambi, over 2,000 pure line cultures in half a dozen varieties of the first and second crops were under various stages of trial. Two strains in *halliga* for the first crop in South Kanara and two strains in *chitteni* for the second crop in Malabar are awaiting trial in the district in the coming season.

At Maruteru, selection work on *swarnalu* and *kasara* was proceeded with and 66 selections have been carried forward for further trial.

(*d*) *Hybridization.*—At Coimbatore, 30 cultures isolated from a cross between Co. 4 (highly resistant to blast disease on paddy) X *korangusamba* (highly susceptible but high yielding) were put down for yield comparison for the first year. Most of the cultures were practically immune while the standard strips alone, interposed at random in the field, showed the disease even from the early stages of the crop. A few of the cultures showed leaf spots only. It was therefore possible to eliminate the cultures that showed symptoms of taking the disease. Bulk seed of the same cross was also carried forward by the svalof method by selecting disease resistant plants every year. This material will ultimately be made use of for selecting resistant plants for trial. Progenies from twenty sets of crosses made to combine economic and desirable characters in some of the strains already under distribution were under various stages of study. Selections from promising sets have been made for further trial. A series of crosses between recognized and popular strains of similar morphological characters, but varying in their capacity for yield and seasonal fitness were made during the year to see if a cosmopolitan strain suitable to a number of conditions could not be evolved.

At Pattambi, 360 cultures in three sets of crosses between local strains and Coimbatore strains were in various stages of trial.

At Maruteru, sixty-one promising strains extracted from hybrid progenies were under yield tests for the third year. Forty of the promising selections have been carried forward for further tests.

5. *Collection of types.*—One hundred and seventy-two varieties from foreign countries and India and 140 varieties grown as purely or partly rain fed in the Presidency were added to the existing collection of about 1,298 types. At Pattambi and Maruteru 173 and 143 types respectively were under observation.

6. *Agronomic studies—(a) Cultural experiments.*—In the dibbling versus transplanting experiment at Coimbatore with a long duration variety Co. 4, dibbling in dry has given significantly higher yields than transplanting. At Pattambi, broadcasting early in the first crop season, again, proved more profitable than broadcasting later after the monsoon had commenced, when transplanting yields better than broadcasting. The difference between wet and dry nurseries for the second crop at Pattambi was not significant. With regard to the age of seedlings the results are in conformity with the previous seasons. So long as the time of planting is normal, it does not matter even if the seedlings are sixty days old. But when planting is delayed, thirty days old seedlings are to be preferred. Results of spacing experiments so far conducted at the different Agricultural Research Stations were in favour of close planting from the view point of yield and that the total yield per acre therefore depended upon the total number of tillers produced in the area. However, very close planting entailed extra cost for transplantation which is not compensated for by the extra yield obtained by close planting. Further experiments were designed to ascertain if similar high yields as in a closely planted crop could be obtained by increasing the number of seedlings to be planted per hole and the distance between the holes. The results of first year trials both at Coimbatore and at Pattambi fulfil expectations. Higher yields as in a closely planted crop were obtained by increasing the number of seedlings per hole with wider spacings adopted in planting. In the experiment designed to find the effect of grading seed paddy by means of concentrated brine solution it was noticed that no advantage was gained by grading the seed into heavy and light, though heavy seed was better yielding than light in the case of Co. 10 a short duration variety. There seems to be no particular advantage in treating the seed paddy more than the normal method of cleaning.

At Maruteru the trial designed to assess the combined effect on yield of rate of sowing, manuring and age of seedling, repeated for the second year, confirmed the previous year's indication of the superiority of forty days old seedlings raised with $1\frac{1}{4}$ lb. seed rate in manured seed beds. The statistical scrutiny of the interactions disclosed that when seed-bed is not manured, thinner sowings gave significantly higher yields than thick sowings.

(b) Manurial experiments.—At Coimbatore, the application of superphosphate to seed-bed has been consistently ineffective for the past three years. Superphosphate to the planted crop was effective only when applied at planting time. The application of sulphate of ammonia (30 lb. nitrogen) was found to yield better than either groundnut cake or castor cake (30 lb. nitrogen). However, each of the three manures was most effective when applied six weeks after planting, though cakes showed better response than sulphate of ammonia when applied at planting. Successive increase in the dose of nitrogen in any form of green leaf manure

contributes to progressive increase in yield. However, wild indigo for the same value of nitrogen gives better response than either dhaincha or *Sesbania speciosa*.

At Pattambi, groundnut or castor cake or green leaf manure (30 lb. nitrogen) gave an increase of 25—30 per cent over no manure. When sulphate of ammonia is applied as top dressing the increase over no manure went up to 40—60 per cent. Neem cake was comparatively poor to the other two cakes mentioned above. However, the application of cakes at the present prices at Pattambi is not remunerative compared to green leaf alone or with sulphate of ammonia.

At Maruteru, the subsidized manurial experiment was terminated at the close of the three year period. The results of the experiment is proposed to be published in the Madras Agricultural Journal. A brief summary of the findings is mentioned below :—

(i) Application of green dressings at 4,000 lb. to the acre to *dalwa* crop was distinctly beneficial and better than the application at 2,000 lb.

(ii) Over a basal dressing of green leaf at 4,000 lb. to the acre, the optimum economic dose consisted in the application of 32 lb. nitrogen and 32 lb. phosphoric acid per acre.

(iii) There seemed to be no difference whether phosphoric acid in conjunction with groundnut cake was applied in the form of milled guano or flour phosphate.

The evaluation of the residual effects of the application of these manures on the succeeding first crop, did not disclose anything tangible.

The three years' results of the experiment to determine the best time of applying a quick acting manure like ammonium sulphate to a short duration second crop paddy showed no difference between application of the full dose of 32 lb. nitrogen per acre at planting time, and up to, a month-and-a-half later. The indication regarding the best time for applying the second half dose of 16 lb. nitrogen, the first half dose having been applied at planting time, varied from year to year.

7. *Fundamental studies—(a) Inheritance of characters.*—The study of characters like glume colour, *asynapsis* and season and period bound habits of rice were continued. The purple colour of the glume in one case has been determined to be due to the interaction of two complimentary factors. '*Asynapsis*' in rice is a mendelian character whose inheritance appears to be controlled by duplicate genes. The progenies of the crosses made for the study of season and period bound habits are under study.

(*b*) *Cytological studies.*—Several naturally occurring sterile mutants were isolated for ascertaining the cytological basis for sterility in rice. One plant has proved to be a tetraploid on

examination and the others are still under study. The varied progenies obtained from the tetraploid and the sterile interspecific hybrid between *O. sativa*—*O. officinalis* are being studied cytologically for chromosome number and breeding behaviour.

8. *Mutants.*—During the year under report, the nature of inheritance of the ageotropic mutant and others giving abnormal ratios in X-rayed families were pursued. Six of the ten promising cultures from X-rayed GEB. 24 were selected for yield trial. Contrary to expectation, four dwarf mutant strains from the same material tillering profusely, lodged under the influence of high manuring, much earlier than GEB. 24. However, two strains gave significantly higher yields than GEB. 24.

A number of somatic mutations were spotted out from materials propagated successively from tillers of the previous crop. Outstanding among them is an economic mutant of higher vigour and early maturity compared to the normal *sirumani*. If these two characters are permanently fixed, the mutation bids fair to be of great economic value to the Tanjore delta.

Some of the other methods of inducing mutations, such as heat and cold treatment of seed and aging, have also been taken up for investigation.

9. *Vernalization.*—Monthly plantings of vernalized seed of two strains Co. 8 and G.E.B. 24 were conducted from May to the end of the year. In all sowings, there was no difference between the treated and non-treated. It is proposed to see if this treatment would help some of the exotic varieties obtained from temperate climate to give them their normal growth.

10. *Quality work in rice.*—Previous work disclosed that rice from a green manured plot developed thicker aleurone layer than the rice from an unmanured plot. This line of study was pursued to find the effect of different manures on the development of the bran layer. Materials from a randomized and replicated set of manurial experiment have been fixed for examination. Polishing trials conducted with red and white rice varieties showed that the removal of 2–3 per cent bran in an improvised rice polisher devised by the Research Engineer to effect an uniform removal of bran layer, gave the best cooking values over unpolished or merely shelled rice. Shelled rice on cooking bursts on the ventral side and the cooked rice is not uniform. Though hand pound rice also loses 2–3 per cent bran layer, the same as in uniformly polished rice, its cooking quality is poorer than the latter owing to irregular removal of the layer from it. Mill polishing entails about 12 per cent loss of the bran layer. It is therefore evident that the rice requires some slight but uniform polishing to give the best nutritive and cooking values. The loss of bran layer in hand pounding is insignificant when compared to the loss in mill polishing.

11. *Irrigation experiment.*—Irrigation experiment at Coimbatore was directed to find how far the yield of paddy is affected by varying the depth of water applied at each irrigation (1½" and 3") and varying the interval between two irrigations (3, 6, 9 and 12 days). The year under report was adverse to the late planted crop at the station for reasons already mentioned in paragraph 2 supra. The units of supply 1½" and 3" per irrigation seem to be insufficient to tide over the seasonal conditions usually prevailing at Coimbatore during the months of September and October. Though the differences between any two treatments are not statistically significant, yet there are indications to suspect that large supply at wider interval may contribute to higher yields. The same experiment supplying 2"and 4" per irrigation is proposed to be conducted next season.

12. *Other crops.*—At Coimbatore, tomatoes, chillies and brinjals were grown in plots specially raised for the purpose. The dominance of pungency over non-pungency was confirmed in F3 generation. Materials for making suitable economic selections combining non-pungency and size have been planted. Sufficient seed of *Sesbania speciosa* received originally through the kind courtesy of the Economic Botanist, Kew Gardens, London, was collected. It is reported that *Sesbania speciosa* grows well in alkaline marshes in Kenya. The nitrogen value is, however, poor compared to the local green manure crops and the effect of the green manure on the rice crop also is not as good as wild indigo. It may, however, be useful if its reported suitability to alkaline lands where no other varieties of green manure crop can be grown, should be confirmed in this Presidency.

At Pattambi, sugarcane, plantains, pineapple and cotton were grown. Sugarcane has been successfully grown for the second year in double crop wet lands as a purely rainfed crop even without an irrigation at planting. Under such conditions, it should be possible to produce a crop of 30 tons. Co.408 and Co.419 are the best yielders under Pattambi conditions. One thousand two hundred and fifty-six pineapple fruits weighing 4,873 lb. were sold during the year realizing Rs. 156. Cultural experiments to reduce the cost of production and study of bud variations and increasing the supply of suckers are under way. Though Co.2 cotton and *podupathi* make a good growth, yet the damage caused by rodents to green and ripe bolls makes the cultivation of cotton unremunerative. Co.2 may occasionally get caught in the north-east monsoon rains during the bolling period. *Podupathi* is best suited in this respect in that its bolling commences clear off the rainy months. A total quantity of 30,074 lb. of guinea grass grown as a rainfed crop was cut and fed to cattle. Eighty thousand pounds of green grass from the aftermath available in plenty at the close of the north-east monsoon was ensiled. The silage making is a routine operation on the station and it helps to solve the fodder problem during summer months.

At Maruteru, sugarcane, cotton and plantains after paddy and soyabeans and pineapple in high level plots were under trial. Of the five varieties of sugarcane under trial, Co. 419 gave the best outturn with 45·88 tons of cane to the acre, proving significantly superior to the rest. Yield trials with the three cotton varieties after *basangi* in wet lands disclosed again that the variety *Uganda bulk* was the best with an outturn of 335 lb. of kappas per acre. Trials with planting single and two suckers of plantain per hole spaced eight feet apart with three varieties did not yield reliable figures on account of heavy damage due to cyclonic winds during April 1937. It was noticed, however, that the variety *bontha* withstood the fury of the winds better than the other two varieties. (*Tella and Karpurachakrakali.*) Two varieties of soyabeans *behrum* and *pengapi* tried on a field scale recorded acre yields of 1,800 lb. and 1,160 lb. respectively.

13. *Special lectures.*—The final year B.Sc. students visited the Paddy Breeding Station when genetical work was practically demonstrated to them. One special lecture was delivered by me on the " Rice Improvement Work in Madras."

14. *Imperial Council of Agricultural Research.*—I attended the Standing Rice Committee meeting held at Delhi on the 4th and 5th March 1938.

15. *Exhibition.*—A comprehensive exhibition to demonstrate the activities of the section was staged during the College Day and Conference held in July. A similar exhibition was put up at Madras during the Christmas week. In addition, charts and specimens for use in some of the local exhibitions in the districts were also sent.

16. *Publications.*—Six scientific papers dealing with rice were either published or sent for publication during the year.

17. *Agricultural training.*—At Maruteru, four of the six students selected for training underwent a short course in practical agriculture for four months from November.

C. R. SRINIVASAN,
Paddy Specialist.

ADMINISTRATION REPORT OF THE COTTON SPECIALIST FOR THE YEAR 1937–38.

1. *Charge.*—I continued to be in charge of the section throughout the year.

2. *Staff.*—Sri C. Jaganatha Rao joined duty on the completion of his training in plant physiology under Dr. T. Ekambaram. Sri S. Sundaram and Sri M. R. Balakrishna Ayyar reverted to their permanent posts when the Madras Fodder Cholam Scheme was closed on 14th June 1937. Sri A. Ramadoss was deputed to work in the Pempheres and Physiological Scheme when Sri S. Anantham was transferred to the Agricultural section. One assistant was transferred to Adoni on 1st May 1937 to start the Mungari Breeding Scheme sanctioned by the Indian Central Cotton Committee, Bombay.

3. *Season.*—For the fourth year in succession, the rainfall was in defect and its distribution unfavourable. Out of the sixty rainy days recorded for the year, only sixteen of them had rains measuring more than half an inch. During the summer when there were few crops on the ground, the rainfall was in excess. During the south-west monsoon the precipitation was short by 1·5 inches. In the important north-east monsoon period only half of the average was registered. As a result all the crops suffered badly. Cottons opened their bolls rather prematurely and yielded much lower than the average. The cereals were stunted in growth and grain setting was poor. The bengalgram crop too was affected adversely.

4. Work done during the year could be divided under two heads (*a*) that relating to the section and (*b*) that done with the financial assistance of the Indian Central Cotton Committee, Bombay.

5. As in the past two years, two generations of cultures were raised with the object of speeding up of the breeding programme. The first crop was grown at Coimbatore from September to March, while the second was raised at Srivilliputtur during summer from March to August on a small area leased for the purpose.

A. Work of the section.

6. *Cotton breeding.*—This was mainly confined to the investigations relating to the improvement of cambodia cotton. The strain Co.2 which is being grown in the district suffers from late maturity, susceptibility to the cotton stem weevil, and from coarseness of fibres. The last point, it may be mentioned is, of late, assuming greater importance especially after the opening of a number of cotton mills in Coimbatore district. Some of these mills specialize in the spinning of higher counts for which they import

quality cottons from outside. Last season such imports amounted to 96,000 bales.

7. Since improvement by single plant selection had not, subsequent to the isolation of strains Co.2, 920 and 1,267, led to useful results, greater attention was paid to hybridization. Again it was experienced that simple crossing between species often proved disappointing. Resort had, therefore, been made to complex hybridization combined with frequent back crossings to the basic strain Co.2. Cottons, like Sea Island, Sakel, Ashmouni, Maarad and Uganda, which are reputed for their quality were used as parents and their direct and back cross progenies with Co.2 were studied with regard to quality, earliness, ginning percentage and yield. 633 cultures were tried in progeny rows and 201 were found to perform better than the standard strain with regard to earliness and yield. The above trials also showed that combinations of R.u.4 and Sakel with Co.2 would prove useful for Coimbatore conditions. The best of them were carried to Srivilliputtur for trial in summer.

8. Eleven cultures which were very promising in the progeny row trials of last season were tested for yield in bigger plots at Srivilliputtur. Seven were distinctly better in yield and earlier by a month in duration. They were tried during the cold weather on the Cotton Breeding Station as well as at six other places in the Coimbatore district. In these tests, were also included the two promising strains 920 and 1,267 which were recording better results than Co.2 for the past two years. As one should expect, the yields of the strains varied very widely from place to place. The Uganda crosses were distinctly earlier by two to three weeks at all centres but their yields were very erratic. On the Cotton Breeding Station, the best results were obtained from 4,383—a Uganda × Co. 2 derivative. At two other places, two other Uganda crosses excelled the standard though not to the extent of being statistically significant. At other places the crosses had failed badly. On the other hand strain 920 was uniformly good in all the centres. This last observation was further confirmed by the yield tests carried out independently by the Deputy Director of Agriculture, VIII Circle, Coimbatore. It has on an average yielded in those trials 13 per cent more than Co.2. It can, therefore, be recommended for supplanting Co.2 in Coimbatore district. Its drawbacks are the coarseness of the fibres and slightly shorter staple. The Uganda × Co.2 crosses are distinctly superior to 920 not only in the above characters but also in earliness and ginning percentages, but they seem to be more sensitive to changes in the seasonal environment, especially when grown under cold weather conditions. They excel Co.2 if sown in summer months and may be preferred in places like Srivilliputtur. Further work is in progress.

9. Some of the Uganda crosses were tried in July under rainfed conditions at Adoni and Anakapalle. In the former place strain 4,383 proved equal to high yielding local Mungari while in the

latter it behaved distinctly superior to the local mixture, their respective yields being 666 and 500 lb. per acre. Another Uganda cross yielded 966 lb. per acre at Anakapalle—an increase of 92 per cent over the control.

10. *Cotton agronomy.*—It is generally believed that seeds obtained from summer pickings are not desirable for sowing purposes. With a view to test the validity of this belief, the seeds of the summer flush from a few strains of indigenous cottons were sown along with those of the first flush. No differences in growth and yield were noticed belieing thus the current opinion. Potculture experiments conducted on the water requirements of cambodia indicated once again that the demand for water was highest during the flowering phase and that it would be desirable to maintain a fairly high level of moisture from the beginning of crop growth. Studies of the variations in the water contents of cambodia leaves during the day, pointed out that irrigations done in the mornings would be more beneficial to the crop.

11. *Other studies in cotton.*—With the object of studying the extent of admixture in the seed samples of Co.2 as sold in the bazaar by merchants, numerous samples were collected from the chief markets of Coimbatore and Salem districts and tested for germination and for the proportion of broken and foreign seeds. It was found that many of the samples had not only poor germination capacity but also contained many offtypes. They emphasized once again the need for the establishment of a reliable organization for the maintenance of purity in the improved strains.

12. Investigations with regard to the mode of inheritance of floral anatomy revealed that the *arboreum* type of vascular anatomy was dominant over those of *herbaceums*, that *barbadense* types and wild cottons were likewise dominant over *hirsutum* and the cultivated varieties, respectively. When Asiatic and American cottons were crossed, the F_1's were intermediate in behaviour. Some interesting observations were also made with regard to the origin of fuzz and lint. It was evident that the fuzz hairs arose from the sub-epidermal region beneath the stomata and that such cells underwent nuclear changes different from those associated with the development of lint hairs. Lintlessness was found to have been brought about either by the disintegration of the epidermal cells or by the gradual separation of the epidermal layer from the sub-epidermis or by the inability of the cells to protrude or by the extreme tardiness in the rate of growth of hair cells. It was also observed that production of lint was influenced by more than one pair of complimentary factors.

13. *Study of other crops—Redgram.*—Three hundred and twenty cultures were tested for yield in progeny rows. Forty-four of them were better than the local. All the early types suffered badly from insects, although they were quite satisfactory with regard to uniformity in growth and seed colour. It was evident

from the increasing mortality in plants that wilt disease is spreading rapidly in all the fields and resistance to wilt should be added on to the existing list of criteria for the selection of biotypes.

14. *Bengalgram.*—Due to the adverse season, the growth of this crop was poor. Two hundred and twenty-four cultures were raised in progeny rows. Forty were superior to the control. Strains 482 and 468 were compared with the local in two villages of Coimbatore taluk. In one, strain 468 was definitely better, while, in the other, the increase was not statistically significant. Some interesting information on the inheritance of seed coat colours was collected in addition.

B. Schemes financed by the Indian Central Cotton Committee, Bombay.

15. Of the four schemes mentioned in the last report, the Madras Fodder Cholam scheme was closed during the year. The other three continued to receive financial help from the committee. A new scheme called Mungari Cotton Breeding Scheme was inaugurated during the year. It may be stated in brief that all the four schemes are concerned with breeding problems, in three of which improvement of staple is mainly sought with a view to eliminate the coarse components in the existing commercial varieties and in the fourth resistance to an insect pest is aimed at.

16. *Madras Herbaceum scheme* was started with the object of evolving strains that would combine all the good points of Karunganni with the hardiness of Uppam, such that they would prove useful to replace the coarse Uppam grown in 'Salems' and 'Tinnies' tracts. As improvement by simple selection proved futile, improvement by hybridization was resorted to. The year under report was the eighth since the commencement of hybridization. Two hundred and fourteen cultures were tested primarily for yield in replicated progeny rows. The final yields await analysis.

17. In addition to the above, twenty-eight strains evolved in the scheme were compared against Karunganni K.I. * and Uppam 2919. The trials should be deemed to be very critical on account of the severity of the climatic conditions. Seven of them were distinctly superior. Uppam 2919 fared very badly thus refuting its supposed claim to withstand adverse seasons.

18. Some of the strains were tested in the districts. Strain 4714 was once again observed to be uniformly the best in all the different ecological zones. It was, however, later and coarser than K.I.

19. Two of the strains were raised under restricted irrigated conditions both in summer and cold weather. It was comforting to note that one of them yielded as much as Cambodia signifying

* K.P.T.I. has been renamed as K.I.

thereby that these cottons could be grown with advantage in localities where the water-supply might not be adequate for the cultivation of Cambodia.

20. *Madras Nadam scheme.*—It has for its object the evolution of an annual biotype that would replace the perennial Nadam in parts of Coimbatore, Salem and Trichinopoly districts. This was in the fifth year of its running. As in previous years an area of 8 acres was leased afresh at Perundurai village and selected cultures were raised in single rows. The season once again proved most disappointing both in total rainfall and distribution with the result that few plants had more than one boll. The local Nadam of the second and third year was, however, able to get through the drought without much reduction in yield bringing out clearly the advantages of the stand-over crop in such seasons. It also indicated the wisdom of including, in the breeding list, types that could stand severe basal pruning in dry months and yet ratoon well in the next year. Such types would in a way help the observance of a close period between two cotton crops.

21. Eight early strains from Uganda crosses were sown in replicated plots on two different dates. The second sowings failed completely, while in the first, strain 4383 which did best both at Srivilliputtur and on the Cotton Breeding Station topped the list yielding 120 lb. per acre against 71 lb. recorded by Co.2.

22. *Madras Pempheres and Physiological scheme* was started in 1931 with the object of devising measures for the control of the stem weevil (*pempheres affinis*) which burrows into the cotton stems, often leading to mortality in plants. On the botanical side efforts are directed towards the evolution of resistant strains. As per programme two generations of direct and back crosses were raised during the year and one thousand six hundred and twenty-five cultures were studied for the incidence of mortality and the extent of adult emergence. Although no culture came up to the ideal limit of combining "Nil mortality" and "Nil adult emergence," it was gratifying to note that a few of them very nearly approached such a condition which in itself should be considered as an encouraging advance towards the solution of the problem under investigation. An idea of the complexity involved in this study might be obtained from the fact that the character of producing rapidly a wound gum, to kill all the young larvæ before they could emerge as adults and form a source of fresh attack, is found in a different and alien species which is found highly susceptible to jassids, perennial in habit, late in maturity, low in productivity and poor in the opening of bolls. Production of a biotype possessing the gum-producing trait of this species with the desirable economic characters of Co.2 necessitates hybridization between two different species. To obtain genic balance amongst the progenies of interspecific crosses, the technique of back crossing has to be adopted frequently but this procedure has, as in the present case an inherent defect of lowering the level of resistance

to the pest with every dose of Co.2 introduced in such back crossings. The study naturally involves the growing of a big population and the searching out for the types combining in a stable manner all the economic requirements from amongst the segregates.

23. Out of three South American varieties, Moco, Verdao and Quebradinho, which exhibit the gum-producing behaviour to the maximum extent, the progenies of Moco × Co.2 were found to be extremely late, liable to shed forms, and poor in ginning; but they were promising with regard to low mortality and adult emergence. Those of the other two were more hopeful with regard to economic characters but poorer in resistance to the pest. It was encouraging to observe that biotypes which manifested the desirable characters to a satisfactory degree in the previous season behaved likewise during the season under report.

24. Valuable and interesting information was also collected on the entomological side of the scheme. Mention was made in the previous report about the starting of experiments for the study of optimum ecological requirements of the insect with reference to humidity and temperature. Scrutiny of the data secured in them disclosed that temperatures above 106° F proved fatal to the insects, and eggs did not hatch beyond 100° F. The optimum limit for the functioning of the normal activities of the insect appeared to lie between 85° and 95° F. A similar delimitation was also found with regard to humidities. Below 40 per cent, the insects showed signs of slow growth and dying out. They were at their best between 60 per cent and 80 per cent.

25. The raising of a Cambodia crop during the offseason indicated the insects' preference to the newly planted crop and also their liability to greater parasitization. Further study of alternate host plants had resulted in the discovery of three hitherto unrecorded food plants and of seven new parasites of which three were also parasites of *pempheres* feeding on cotton. The last point would be of some importance on account of the fact that *pempheres* living on certain weeds would not take kindly to cotton and the parasites feeding on such insect hosts manifested similar preferences. Apart from the above. useful information was gathered on the biology of a good number of parasites.

26. Some progress was also made on the bio-chemical aspect of the *pempheres* problem. In the last year's report some doubt was expressed on the use of total polysaccharide as a criterion for testing the degree of resistance to the insect. This was further studied with regard to the composition of the sub-groups. Fractionation was attempted by means of specific carbohydrases. The interesting observation was made that the resistant varieties contained consistently greater proportions of the fraction hydrolysable by B-amylase indicating the presence of an agency which inhabits the condensation of hexose beyond the stage of dextrins. The results when complete, would justify the assumption of quantitative

differences in the metabolism of the two plant groups. Another observation that was brought to light during the year was the consistency in the gumming behaviour of the resistant South American varieties under different ecological conditions in contrast to the fluctuating behaviour exhibited by Cambodia.

27. The physiological part of this scheme consists in the investigation of a peculiar problem at Koilpatti where Karunganni cottons have been found to suffer from profuse shedding of buds and bolls as a result of rains falling in February. It is sought to overcome this defect by the isolation of suitable strains. The effects of rainfall are being studied by irrigating the cultures during January and February.

28. Results of last year showed that six out of the twenty-one cultures not only resisted shedding but also tended to give enhanced yields as a result of watering. They were again compared during the year with the standard K.I. The response to watering was favourable in four of them. Some of these strains were also tested against K.I. under completely rainfed conditions. One of them gave an increase of 19 per cent over K.I. It would thus appear that the object of the scheme would soon be fulfilled. It was further noticed that out of the three waterings, that timed on 1st February was most prejudicial to yield.

29. Twenty-two strains isolated in the Madras Herbaceum scheme were tested for their response to watering during the flowering phase. Strain 4714 alone withstood the adverse conditions proving thereby its excellence both in yield and in resistance to the effects of untimely rains.

30. *Mungari Cotton Breeding scheme.*—As stated previously it was started during the year with the object of breeding medium stapled strains to replace the short stapled coarse Mungari cottons grown on the red and mixed soils of Anantapur, Bellary and Kurnool districts. The experiments relating to this scheme were conducted at Adoni on a block of land leased for the purpose. Ninety-two single plants selected for ginning percentage and lint length at Coimbatore from amongst the varietal collections, were sown in progeny rows. The season proved extremely droughty and the whole tract was declared by Government as famine-stricken. Notwithstanding such severity thirty-nine of the cultures proved as good as control.

31. Besides, a number of strains were imported from Coimbatore, Parbhani (Hyderabad Dominions) and Nagpur, and tested for yield against the local Mungari and M. 274, a Mungari strain evolved at Hagari a few years ago—at Adoni and six other places. In three of them the crops failed completely due to insufficiency of rains. In the other three they were somewhat better. At the trial conducted at Adoni, it was encouraging to find four strains from Coimbatore, two strains from Parbhani, two from Nagpur and

M. 274 from Agricultural Research Station, Hagari, recording as much yield as the local Mungari.

32. *Madras Fodder Cholam scheme.*—The final results of the experiments conducted in connexion with this scheme pointed out that the injurious after effects of cholam growing could be off-set by sowing cotton thick by using a higher seed-rate to cholam with a view to inhibit grain setting and by not ploughing the cholam stubbles till the commencement of the north-east monsoon. The scheme was closed on the 14th June 1937.

33. *Miscellaneous.*—I attended, as a member, two meetings of the Indian Central Cotton Committee, three meetings of the Cotton Purchase Committee of the Central Jail, Coimbatore, one meeting of the Agricultural College Council, one meeting of the Botanical Sub-Committee of the Imperial Council of Agricultural Research, Delhi, three meetings of the Research Council and a meeting of the Agricultural Station Reports Scrutiny Committee. In collaboration with the Deputy Director of Agriculture, VIII Circle, Coimbatore, a scheme for the spread of improved strains in Coimbatore taluk was drafted and submitted. I delivered a special lecture on 'Principles and Practice of Cotton Breeding' to the B.Sc. (Ag.) students.

34. His Excellency the Governor of Madras, Sir Arthur Hill, Director, Kew Botanic Garden, Dr. R. Gates, Professor of Botany, King's College, London, Dr. E. H. Crowther of Rothamstead, Dr. F. M. Crowther of Imperial Chemical Industries, Dr. Tothill, Director of Agriculture, Uganda, Mr. H. Miurs, Director, Experimental Station, Formosa, Mr. K. Ramiah, Geneticist and Botanist, Institute of Plant Industry, Indore, visited the station.

V. RAMANATHAN,
Cotton Specialist.

6th May 1938.

ADMINISTRATION REPORT OF THE MILLETS SPECIALIST FOR THE YEAR 1937–38.

I submit herewith my administration report for the year ending March 1938.

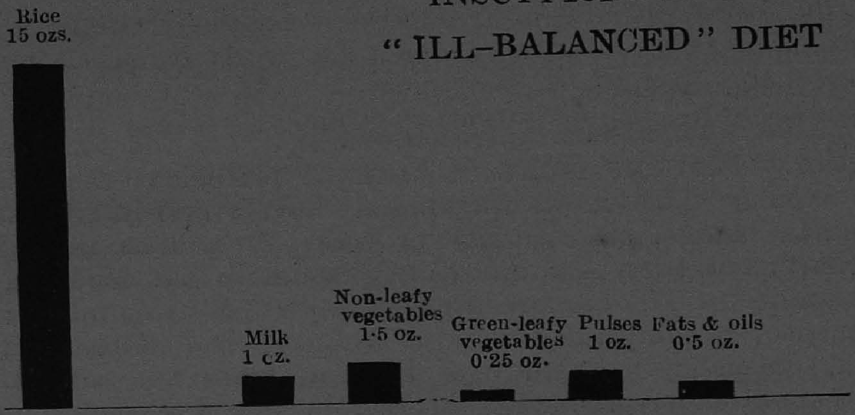
2. *Millets in human nutrition.*—Millets are the food crops of the poor. They are grown in areas of precarious rainfall. The chart in this report shows that millets have a role in the nutrition of human beings, be they rich or poor. It will be noticed from the chart that there are many deficiencies in our food, requiring to be made up. The substitution of millets to rice, up to a third of our rice consumption will be a cheap method of removing part of this deficiency. A study of the rice trade has revealed that there is an under-production of rice in this Presidency and the suggested reduction of rice consumption is a step in the right direction. Enough millets are produced to make good our needs in cereal foods. There is an additional advantage. Millets produce a very large quantity of fodder. This fodder helps animal husbandry and contributes to the making up of deficiencies in the consumption of dairy produce. Millets make less demand on water-supply in irrigation schemes. It will thus be obvious that millets play an important part in both human and animal nutrition. This administration report is submitted on this background.

3. *Charge.*—I was in charge of the office of the Millets Specialist during the year, except for a period of leave for four months from the 29th of July. During this leave, the first assistant, Mr. C. Vijayaraghava Acharya, Superintendent, Dry Farming Station, Hagari, officiated as Millets Specialist and the second assistant, Mr. P. Krishna Rao, officiated as Superintendent of the Dry Farming Station.

4. *Tours.*—I was on tour for 30 days in the year and the officiating Millets Specialist for 20 days. Six assistants were out on tour for a total period of 61 days, and 4 fieldmen for 19 days.

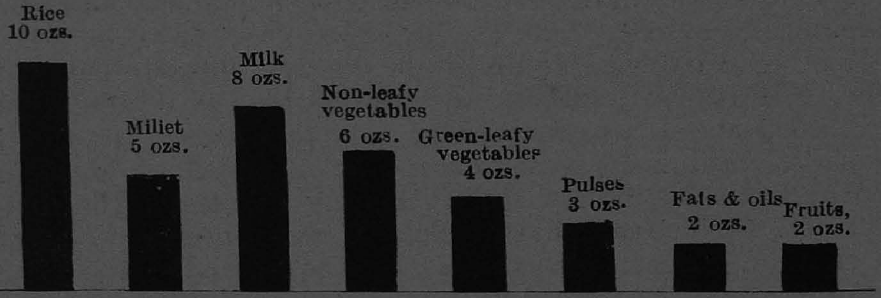
5. *Millets work at out-stations.*—The work of the millets assistants for the Bellary, Kurnool, Guntur and Tinnevelly areas will be found in the reports of the respective Circle Officers. During the year a new centre of work was started at the Palur Agricultural Research Station to cater to the needs of that tract. One assistant and one fieldman were posted from the staff at Coimbatore. The staff at Koilpatti was reinforced by another assistant and fieldman from headquarters. As at Nandyal, the increasing work at Koilpatti has necessitated this strengthening. Assistant, Mr. V. Panduranga Rao, working at the Dry Farming Station, in the Bellary district, returned from his training at Nebraska and resumed his duties at Hagari from the 15th of November. His specialisation on root studies under Dr. Weaver should prove of considerable help in the progress of research on dry farming.

INSUFFICIENT AND "ILL-BALANCED" DIET



1,750 Calories—less than average adult daily requirements.

ADEQUATE AND "WELL-BALANCED" DIET



2,600 Calories—average adult daily requirements.

Adapted from Health Bulletin No. 23 by W. R. Aykroyd, M.D.,
Director, Nutrition Research Laboratories, Coonoor.

6. *Retrenchment.*—The post of Farm Manager was abolished as a measure of retrenchment with effect from the 1st April 1938. The Millets Breeding Station is now being managed by the scientific assistants. This arrangement together with the posting of two assistants and two fieldmen for work at out-stations, has curtailed the strength of the scientific staff at headquarters with a corresponding augmentation in trained workers at the circle stations.

7. *The Millets Breeding Station.*—The total rainfall of the year was 4·56 inches below the average for the past fourteen years. The precipitation in the hot weather was 3 inches above the average. This rainfall was helpful in the preliminary cultivation of the dry lands and in lessening the irrigation of the summer crops. The south-west monsoon rainfall was 1·34 inches less than the average, and was insufficient for sowings in dry lands. The single plant selections and other important seed material of the rain-fed crops had to be sown and started under irrigation early in August so as not to miss the proper sowing time. The other dry land sowings were gone through with the help of rains received close after the above sowing. The north-east monsoon rainfall in the months September, October and November was only half the average. As, however, the whole of this quantity was received during the growth period of the crops, it was just sufficient to sustain them with the result that fairly good crops were obtained.

8. *Cholam* (*Sorghum vulgare*, Pers).—Over 2,000 units were sown and studied during the year.

(i) *Economic*—(*a*) *Yield trials.*—There were four series of comparative trials in the summer season of which three were with white grained varieties and one with yellow. In the white grain series, one trial was with two strains of *Chitrai Vellai cholam*, A.S. 732 and A.S. 1543, about 110 days in duration. In this series, M.S. 3155 (the bulk seed of Central Farm) was used as the standard. Both these strains were found to be superior to the standard. In the second series consisting of strains of about 100 days duration intended for the Coimbatore tract, A.S. 1575 was the standard and it was found to be superior to the other two selections in the trial. In the third series with strains about 100 days in duration intended for the North Arcot, Chittoor, Madura and Tinnevelly districts, A.S. 2095 was the standard and in this trial the differences between the three strains compared were not statistically significant. In the yellow grain series, A.S. 1195 proved better than the standard, A.S. 809. It is defective in that its grains are smaller than those of A.S. 809. Further selections in both white and yellow grained varieties have been under preliminary tests. Of these, three white and three yellow strains are promising. These have been selected for comparative trials next year.

In the main (rain-fed) season there were two yield trials one in the *Peria Manjal Cholam* and the other in the *Talai Virichan Cholam*. Twelve selections from the *Peria Manjal Cholam* were compared with A.S. 29 as standard and the differences in yield among the strains were not statistically significant. In the *Talai Virichan* series, seven selections were tried with A.S. 1093 as standard and the varietal differences within the strains were not significant. In preliminary yield trials with *Peria Manjal Cholam* out of sixteen selections none were found to be better than the standard, A.S. 29. In the *Talai Virichan* series out of sixteen selections, nine gave yields higher than the standard, A.S. 1093.

There are very many varieties in *cholam* each suited to its own tract. Very few varieties are cosmopolitan in their distribution. The *Tella Jonna* of Bellary does not do well in the adjacent Nandyal valley. Economic work for local areas is best done in the respective areas and for this purpose assistants trained in millets are functioning in the Bellary, Kurnool, Guntur and Tinnevelly areas. Strains evolved at Coimbatore have been distributed in the past on a reconnaissance basis to test their suitability. After the ascertainment of the suitability of the strain in question to the tract concerned, systematic trials should follow. Season varies from season. Reports on preliminary observation plots reveal the tracts in which particular strains are likely to have a fair chance. It has been observed that A.S. 1575 is suited to the Coimbatore tract. A.S. 2095 has been found to be suitable to the Vellore, Madura and Tinnevelly areas. A.S. 29 and A.S. 1098 are much in demand in Coimbatore, Trichinopoly, North Arcot and Chittoor districts. As a result of these preliminary observations systematic trials are projected in these areas to ascertain the extent of their superiority and the constancy of this excellence. At present 27 district trials are in progress.

(*b*) *Fodder*.—Among the strains tried, A.S. 3355, the late tall *Patcha Jonna* has proved to be the best for fodder. Its long duration necessitates an early sowing, and this can be done only under wells. This strain has been given out for trial at Coimbatore and Erode. In the strain evolved from the cross between *Peria Manjal Cholam* and *Yerra Jonna* of Bellary, the height of the plant and its heaviness consequent on juiciness led to bad lodging. This strain has now been back crossed with the local parent with a view to further selection to minimize this defect. It has been found that juicy plants cannot afford to be very tall.

(*c*) *Malt making*.—To meet the requirements of the Agricultural Chemist, enough seed of two varieties, A.S. 4250 and A.S. 4376, was multiplied and supplied.

(*d*) *Striga resistance*.—Striga is a flowering parasite whose roots attach themselves to the roots of sorghum and deplete the host plant of its sustenance. The local *Peria Manjal Cholam* is very susceptible to the attack of striga. Among a number of varieties imported for study, one variety from Tanganyika and another from Bombay were found to be practically free from

attack. Both these varieties have been crossed with the local variety with a view to study the possibilities of infusing this resistance.

(ii) *Scientific.*—Continued progress was maintained in acquiring knowledge of the inheritance of characters in sorghum. Two new types of chlorophyll deficiencies named Xantha and Patchy albino have been met with. These seedlings die off a few days after germination. They have proved recessive characters and can be eliminated by the selection of homozygous dominants. It has been found that the juiciness factor in the stalk is independent of the factor for producing brown colour in the mechanical tissue. Some African sorghums have been noted to have purple colour on the glumes close after the emergence of the earhead, whereas in the local sorghums this colour develops at the dough stage of the grain. This manifestation at emergence is not an accident, but is constant, heritable and dominant. Studies in the flowering habit of sorghum have been continued. It is interesting to note that the Sudan grass (a wild sorghum) finishes its flowering before sunrise and that Johnson grass (another wild sorghum) only well after sunrise. Most of the cultivated sorghums flower during the night. These interesting variations in the flowering habit of sourghum throw helpful light in tracing the origin and affinities of cultivated sorghums.

9. *Cumbu* (*Pennisetum typhoides*, Stapf and Hubbard).—Two series of comparative trials with four irrigated varieties in the summer season and three series of comparative trials with twelve rain-fed varieties in the main season were carried out. In the summer season in series I, selection "Whip" P.T. 700 has given for a second time a significantly higher yield than Punjab *cumbu*, P.T. 499. In series II, P.T. 2229, *Kottappuli cumbu*, was compared with a selection from *Velli Cumbu*, P.T. 2125, and the difference between the yields was not significant.

In the main season trials, P.T. 248 (*Kattu cumbu*, Coimbatore) was taken as the standard to compare with eleven selections in three series. In the first series, thin headed and many tillered varieties typical of the southern districts, in the second series big and single headed varieties typical of the Deccan and in the third series selections from foreign varieties and crosses with them were compared with the standard. Of these, P.T. 367, a selection from Bombay *bajri* was found significantly better than the standard for a second time. Two selections, P.T. 17 and P.T. 393 (from the Ganjam district) have been found to give heavy yields of fodder.

P.T. 2229 (*Kottappuli cumbu*), P.T. 499 (Punjab *cumbu*) and "Whip" P.T. 700 have been chosen for district trials in Coimbatore, Trichinopoly, North Arcot and Chittoor districts. Punjab *cumbu* with its long earheads has attracted attention for some time and P.T. 700 promises to be an economic strain in this Punjab type of earhead.

10. *Ragi* (*Eleusine coracana*, Gærtn)—(*a*) *Yield trials.*—In the summer season there were two series of comparative trials with selections 115 days in duration and E.C. 3030 as standard. In the first series, E.C. 3735, a new strain of *ragi* has given a 10 per cent increase over the standard. In the second series, three selections from a local variety called *Mutti Ragi* were compared with E.C. 3030 and none of them were as good as the standard. In the main season there were two series of comparative trials. In the first series three strains were compared with E.C. 593 as standard. Of these, the new strain, E.C. 3735, with a duration shorter than E.C. 593, has given a 10 per cent increase over E.C. 593. This increase has not been significant, owing to the high standard error of the experiment. This comparison will be continued next year. In the second series three strains were compared with the standard E.C. 3030 and none of them were found to be better.

(*b*) *Ragi strains in the districts.*—At Erode in the Coimbatore district, a regular yield trial was conducted with E.C. 593, E.C. 3735 and local seed in randomized blocks, in the December–March season. Statistical analysis of the data shows that the two strains have yielded 21 and 33 per cent more than the local and that the increases are statistically significant. The trial will be made in the main season also.

Ragi strain E.C. 593 continues to be popular as judged by the quantity of seed issued from the Millets Breeding Station. The following figures give the quantity supplied for trial and sale distribution during the last seven years :—

Year.	Seed issued.
	LB.
1931–32	72
1932–33	355
1933–34	2,500
1934–35	4,165
1935–36	5,632
1936–37	4,508
1937–38	7,507

In certain tracts the long duration of this strain was a handicap to its spread. This notwithstanding the demand for the seed is increasing and this indicates that though it may be longer in duration, its increased yield is being appreciated by the cultivators. With a view to evolve a strain which is shorter in duration than E.C. 593 and which yields equally well, many single plant selections were under test as a result of which a new selection E.C. 3735 has been found to be satisfactory. In tracts where a long duration is a handicap, E.C. 3735 will be tried as a substitute for E.C. 593. Preliminary trials with this new strain are being arranged in the districts.

A new aspect of the excellence of E.C. 593 is its suitability as a rainfed crop. Out of the four strains supplied to the Research

Station, Anakapalle, E.C. 593 has topped the list giving an yield 49 per cent. more than the local *ragi*, the duration of both being the same. Again, in the Salem district, E.C. 593 was tried against H-22 of Mysore under rain-fed conditions. In the three places where it was tried, E.C. 593 was found to do better than H-22. The Assistant Director of Agriculture reports that there is a chance of E.C. 593 replacing H-22. In the current year it is proposed to try E.C. 593 in the Vellore division as a rain-fed crop.

11. *Korra* (*Setaria italica*, Beauv).—In the summer season there was one yield trial in which five strains of irrigated *korra* were compared with the standard strain S.I. 544. Four strains were found to be significantly better than the standard. These have a red or tawny red seed coat colour. S.I. 544 is *Korra* buff in colour and this colour is generally in favour. In the main season eleven strains of rain-fed varieties were compared with the standard S.I. 523. S.I. 523 maintained its status as the premier strain evolved for the dry land conditions of Coimbatore. These two strains S.I. 544 for garden lands and S.I. 523 for dry lands are being given out for trial in the districts.

12. *Panivaragu* (*Panicum miliaceum*, L).—A crop of 149 units was sown in December 1937. A comparative trial was made between two promising selections, P.V. 36 (buff yellow coloured grain) and P.V. 31 (dark olive grey) by the A.B.B.A. method with eight replications. P.V. 36 yielded 14 per cent. more grain than P.V. 31 and the difference was statistically significant. The grain of these two varieties was husked and P.V. 36 gave 74 per cent. rice and P.V. 31 gave 70 per cent.

13. *Lablab* (*Dolichos Lablab*, *Roxb. and* L).—Two buff seeded strains D.L. 809 and D.L. 231 were put into an yield trial with ten replications. D.L. 231 gave an increased yield of 17 per cent and this was statistically significant.

14. *Cowpea* (*Vigna catjang*, Walp).—Two crops of cowpea were raised, one in the main season as a rain-fed crop and the other in the summer as an irrigated crop. Altogether 650 units were under study. Promising selections were sown for observation in three series of preliminary comparative trials, one for foliage, the second for grain and the third for vegetable. In the first series, four types, C. 37, C. 42, C. 422 and C. 512, were found to give heavy yields of foliage, fit for both fodder and green manure. In the second series, four strains C. 20, C. 92, C. 100 and C. 521, were chosen for their capacity for grain yield. In the third series, strain C. 419 was the best among the three strains for the yield of green pods. A few varieties of cowpea had big seeds which could be used as green peas, and for this purpose nine selections have been made from among these.

15. *Redgram* (*Cajanus indicus* Spr.).—With a view to open up the sub-soil and also to increase the revenue from the station, redgram was sown in 3·67 acres in field No. 3. It yielded 3,600 lb. of grain which together with stalks fetched a revenue of Rs. 213.

16. *Seed distribution.*—Improved seeds are distributed to the ryots through the Agricultural Demonstrators. The primary supply is from the Millets Breeding Station, whose seed stock is augmented by seed multiplied on the Central Farm and the Cotton Breeding Station. The supplies to the Demonstrators represent only the initial wave in the spread of the strain, and this is continually kept up. The poor economic backing of the average cultivator of dry lands does not induce him to invest on fresh seed every year. He is inclined to preserve his own seed.

In *cholam*, 11,800 lb. of seed were distributed. Of this, 8,600 lb. were of the rain-fed *Peria Manjal cholam* strains A.S. 29 and A.S. 1098. In irrigated varieties, 3,200 lb. were distributed of the strains A.S. 1575, A.S. 2095 and A.S. 809. In *ragi* 7,500 lb. were distributed, mostly of the popular strain E.C. 593. In *cumbu* 2,000 lb. were distributed. This was mainly of strain P.T. 2229 and P.T. 499. In *korra* 100 lb. of seed were distributed. Altogether 21,400 lb. of seeds of improved millets strains were distributed during the year.

Small quantities of various millets seeds were sent on request to Mr. Karper, Sorghum Breeder, Texas; the Economic Botanist, Peradeniya; the Millets Botanist, Punjab; the Economic Botanist, Imperial Agricultural Research Institute, and the Imperial Mycologist. New Delhi, the Plant Pathologist, Dry Farming Station, Rhotak; the Agricultural Officer of Baluchistan, Quetta; the Economic Botanist and the Deputy Director of Agriculture, Livestock, Assam.

17. *Poultry Feed.*—Millets are in demand as poultry feed. About 5,000 lb. of mixed millets were supplied to the Agricultural Stations for this purpose.

18. *Instruction to students.*—A demonstration on mendilism in millets was given with the help of field material to the third year B.Sc. agricultural students in December 1937. A special lecture was delivered to them on "The Genetics of Sorghum" in January 1938.

19. *Exhibitions.*—A comprehensive exhibition was arranged in the Freeman Building during the college day and conference in July. A similar exhibition was arranged in the Research Institute on the 12th of October when His Excellency the Governor of Madras visited the Institute. Samples of earhead and grain and charts were exhibited at the All-India Khadi and Swadeshi Exhibition at Madras, the Swadeshi Exhibition at Salem, the Deepam Festival at Tiruvannamalai and the Ekadasi Festival at Srirangam.

20. *Special reports.*—The following special reports were prepared and submitted :—

(1) The possibility of crop planning for increased fodder production with special reference to leguminous fodder crops.

(2) A summary of the progress of scientific and other important agricultural work carried on during the year 1937.

(3) Scrutiny of seed distribution schemes in Bombay, the United Provinces, and Europe, in connexion with a general seed distribution scheme.

21. *Publications.*—Considerable knowledge was gained during the year on the mode of inheritance of important plant characters both from an economic and scientific point of view. Twelve articles on *cholam*, two on *ragi*, and one on *korra* have been published during the year in the Madras Agricultural Journal, the Indian Journal of Agricultural Science, Current Science, the Proceedings of the Indian Academy of Sciences, and Beiheften zum Botanischen Centralblatt of Germany.

22. *A popular account of the work of the Agricultural department*, 1922–1935.—I was in charge of the editing and compilation of this Popular Account.

23. *Meetings.*—I attended meetings in connexion with the following :—

(1) The Research Council as President,
(2) the Committee for the Scrutiny of the Agricultural Research Station Reports, and
(3) the Joint Committee of the Dry Farming Scheme.

24. *Indian Science Congress.*—I attended the Jubilee Session of the Indian Science Congress at Calcutta in January 1938 at which I read a paper on "The Inheritance of Basal Feathered Stigmas in Sorghum."

25. *Audit.*—The accounts of the Millets Breeding Station were audited by me for the year 1936–37.

26. *Visitors.*—The following were some of the distinguished visitors to the section :—

His Excellency the Governor of Madras; Sir A. Hill, Director, Royal Botanic Gardens, Kew; Prof. R. Gates of the London University; Dr. E. M. Crowther, Rothamstead; Mr. F. Crowther, Plant Physiologist, Sudan; Mr. F. M. Andrews, Plant Pathologist, Anglo-Egyptian Sudan; Mr. Tothill, Director of Agriculture, Uganda; Mr. A. G. Beattie, Senior Agricultural Officer, Nigeria; Mr. A. B. H. Khoorshid, Economic Botanist, Hyderabad; Mr. T. G. Rama Ayyar, Director of Agriculture, Mysore; Mr. N. S. Apte, Director of Agriculture, Gwalior State; Dr. T. C. N. Singh, Economic Botanist, Sabour; and Diwan Bahadur S. E. Ranganatham, Vice-Chancellor of the Madras University.

27. *Acknowledgment.*—I record with great pleasure my appreciation of the hard work and co-operation of my staff.

G. N. RANGASWAMI,
Millets Specialist.

ADMINISTRATION REPORT OF THE OIL SEEDS SPECIALIST FOR THE YEAR 1937–38.

I submit below my administration report for the year 1937–38.

2. I remained in charge of the section throughout the year excepting for the period of 14 days from 26th February 1938, when I was on leave.

3. The work of my section may be divided into two main divisions: (*a*) research and (*b*) advisory. The aim of the research work is to enhance the profits of the producer by reducing the cost of cultivation. Original investigations on groundnut, castor, coconut and gingelly are being carried out with a view to produce superior seed with high yield and high quality and to effect improvement in the cultural and manurial practices. The report deals very briefly with some of the more important items of work. The marked increase in the advisory activities which occurred during the year indicates the growing public interest in agricultural matters.

4. *Groundnut—Production of improved varieties.*—The demand for the seed of improved variety A.H. 25 could not be met fully. This variety is rapidly replacing the local spreading variety. The problem in the groundnut is to produce a strain which yields more, has higher oil-content, shells better and weighs more for a given unit of volume. In addition, earliness, bunch habit, resistance to drought and disease are desirable. The problem is, therefore, a complex one, requiring both selection and hybridization.

(*a*) *Selection.*—Two bunch selections which have proved superior in yield cannot be distributed to the public for the simple reason that the pods of these weigh one to two ounces less per Madras measure than the local variety. It is interesting to note how the use of measures instead of weights hampers the progress of improvement work. In the preliminary trials ten bunch selections have yielded significantly more than the control, the increase being as much as 24 per cent. for the selection No. 1320. Even these suffer from the above mentioned disadvantage.

Of the five spreading selections in the comparative trials, three equalled A.H. 25 in yield; these are superior in shelling percentage but defective in the weight to volume relationship. Fifty-five spreading selections were under preliminary comparative trials. The selection No. 678 has yielded significantly more by about 10 per cent. than A.H. 25, and it is superior to A.H. 25 in shelling percentages and weight-volume relationship. Besides, by sowing this selection, there would be a saving of 25 per cent. in the seed-rate as its kernels are smaller in size. Qualitatively several other selections have proved superior to the control but they do not exceed the control in yield.

One thousand six hundred selections were under observation, and of these about 50 per cent. will be carried forward.

(b) *Hybridization.*—Over three hundred hybrid selections were studied and further selections were made. To evolve high yielding bunch types with short-duration, high oil-content and dormancy of seed, eight crosses were effected between the bunch and the spreading varieties. To locate the parental combinations which give maximum vigour, eighty cyclic crosses were made.

5. *Dormancy of seed.*—It is well known that the pods of the bunch variety germinate in the field if the rains are received after the ripening of the pods. Naturally, the yield is reduced and there is a tendency on the part of the producer to harvest immature stuff which is of poor quality, being high in free fatty acid content. The pods of the spreading varieties do not germinate in this manner. Among the bunch varieties, H.G.1. and Spanish Bombay were found to behave just like the spreading varieties, which require about three months' resting period.

6. *Root studies.*—A fine root-system would be a solid foundation for any new strain. One must, therefore, locate the variety which has the finest root-system. This can only be done by studying the root-system of a number of varieties. From the observations on the root-systems of six varieties, it was found that in general the spreading varieties have a better developed root-system than the bunch varieties. The improved variety A.H. 25 has a better system of roots than the local variety. The common bunch variety—Gudiyattam bunch—has a superior system of roots than H.G. 1. The groundnut species *Arachis Nambyquarae* and the hybrid form *Gigantea* have the most well developed roots.

7. *Developmental studies.*—To study the differential rates of growth, twenty plants in each of the twenty-three varieties were closely observed. In the spreading varieties maximum rate of growth was noticeable during the fortnight immediately following the first flowering, and in the bunch types during the second fortnight after first flowering. In the bunch varieties most of the flower production takes place during the fortnight immediately following the commencement of flowering, while in the spreading it occurs during the third and fourth fortnights. In the hybrid form *Gigantea*, the flowering was observed to progress uniformly. The indigenous groundnut variety which is now more or less extinct stood foremost in flower production, but it was the poorest in the matter of fertilization and setting. The improved variety A.H. 25 gave the maximum percentage of fertilization.

8. *Manurial experiments.*—An application of a basal dressing of cattle manure at the rate of 3 tons per acre did not enhance the yield. The applications of potassium sulphate (1 cwt. per acre) and superphospate (2 cwt. per acre) increase the yields. The response of plants to potash and phosphate was apparently depressed in the presence of even a small dose of ammonium sulphate (½ cwt. per acre). In general, the groundnut plant did not respond to nitrogenous manures.

9. *Castor—Production of improved strains.*—Fourteen selections from the progenies of crosses and five selections from the varieties were under final comparative trials. The hybrid selection No. 59-2-1-1 has yielded about 30 per cent. more than the control, and two other hybrid selections appear promising. Moreover, these selections are early maturing by at least a month. It is proposed to distribute some of these promising selections for trial in the districts.

Six horticultural types with attractive heads have been isolated from the crosses. Two hundred and eighty-one types were inbred.

10. *Gingelly—Production of improved varieties.*—Mass-selected seeds of eight promising varieties were tested in the Latin squares for their yielding capacity, but the general effect of the varieties did not prove significant. One of these, S.I. 84, was found to contain 53·83 per cent. oil, i.e., about 4 to 6 per cent. more than in most of the local varieties. Thirty selections were carried forward.

11. *Coconut—Manurial experiment.*—The experiment was started in 1932 and concluded in 1938. Among the various manures tried, an application of 3 lb. of ammonium sulphate and 20 lb. of ash per tree per annum is the most profitable one. Other manures, viz., cattle manure at 100 lb. per tree, ash 20 lb. per tree, and fresh fish 40 lb. plus ash 20 lb. per tree per annum, did not prove so remunerative. The differences between the two methods of applying the manure were not significant, but on grounds of economy, the broadcast application is to be preferred as the application of manure in trenches costs As. 1–9 more per tree.

Cow-gram is being grown as a green-manure crop on the coconut stations for the past ten years. With a view to find out the most suitable type for green manuring, a varietal trial with six South Kanara varieties and three strains from the Millets Specialist was conducted. Three strains produced by the Millets Specialist proved superior to the South Kanara varieties.

12. *Button-shedding.*—The artificial pollination of the female flower significantly reduces setting percentage by about six per cent. and it proves conclusively that shedding of the "buttons," i.e., female flowers, is not due to the scarcity of pollen. The question naturally arises as to whether the shed buttons have been fertilized at all. From the anatomical examination of the buttons it was found that about fifty per cent. of the shed buttons are fertilized and the remaining fifty per cent. are either unfertilized or ineffectively fertilized. The shedding of the buttons could not be reduced by disinfecting the central stigmatic canal and the three septal nectaries which extend down to the ovary.

13. *Coconut breeding.*—Some years back seedlings raised from self and naturally pollinated nuts were planted at Pilicode. Since the 'self' and 'natural' progenies of the same parents are available, it was deemed worth while to study the progenies so as to

obtain indications regarding the most suitable technique for breeding the coconut. Whether hybridization or self-fertilization would give quicker results is the point under consideration. In respect of early flowering, greater number of leaves and length and girth of stem, the 'natural' progenies appear superior to the self-progenies.

Recently seedlings raised from the nuts obtained by self, cross and natural pollination have been planted at Nileshwar and extensive data are on hand. Here also the 'crosses' and 'naturals' are found superior to the 'selfs' in respect of height and girth of the seedlings and number of leaves; but the vigour in the 'crosses' is much more than the vigour in the 'naturals.' Since 'natural' and 'cross' progenies show more vigour than the 'self' progenies, the most fruitful line of enquiry would be the production and utilization of heterosis.

14. *Selection of seed and seedling.*—Seed coconuts were collected from young, middle-aged and old trees, and seedlings were raised. No difference was noticed either in germination or in the production of leaves. The data, therefore, do not suggest the necessity for the prevailing practice of selecting seed nuts only from the middle-aged trees which came probably in vogue either from tradition or on the assumption that only progenies of trees in their prime of life will alone be good bearers.

The conception of a good seedling is that it must be healthy, fully grown up for the age and must have large number of leaves. The combined effect of the above qualities will be found in the weight of the seedlings. In the case of the seedlings the weight can be ascertained only after the seedlings are pulled out. The preliminary selection should, therefore, be based on other considerations, a knowledge of which would help in estimating the weight of the seedlings. The height and girth are the special characters that can be ascertained in a standing crop. From simple partial and multiple correlations between the weight of the seedling, its girth and height and number of roots, it is found that, for selection of good seedlings, both the girth and the height are to be taken into consideration, but the girth is the more important of the two characters.

15. *Cashewnut—Different types of nuts.*—The germination of the cashewnut starts on the fifth day and extends up to 12–15 days. Big sized and heavy nuts which sink in water, give the maximum percentage of germination. Flat and light nuts are found to contain more shell and less of kernel. The yellow 'fruits' (fleshy portion, false fruits) keep better than the 'red fruits' which desiccate more rapidly.

16. *Miscellaneous—Qualitative determinations.*—One thousand forty-eight samples of groundnut, one hundred and six samples of castor and eighty-four samples of gingelly were analysed during the year for oil-content and acidity. Such qualitative determinations as the number of seeds per pound, the weight to volume

relationship of seeds and shelling percentage, were made on all the important selections and varieties of groundnut and castor.

17. *Imperial Council of Agricultural Research Schemes.*—This was the first full year during which the scheme for groundnut research was in operation. The inauguration of the scheme has considerably facilitated the work.

A detailed programme of work was drawn up for the scheme of research on the coconut; and the inauguration of the scheme is awaited.

18. *Seed distribution.*—The following quantities of seed were distributed during the year :—

	1937–38.	1936–37.
Coconut seednuts	10,266	14,535
Coconut seedlings	1,152	1,511
	LB.	LB.
Cashewnut	228	289
A.H. 25 groundnut	4,353	3,986
Other groundnut varieties ..	1,532	2,133
Gingelly	47	77
Castor	51	13

19. *Publications.*—During the year three papers were published.

COIMBATORE,
2nd *May* 1938.

J. S. PATEL,
Oil Seeds Specialist.

ADMINISTRATION REPORT OF THE GOVERNMENT ENTOMOLOGIST, COIMBATORE, FOR 1937-38.

I beg to submit herewith the following report on the work of the Entomological section for the year ending 31st March 1938. The section completed 25 years of its useful existence on 24th April 1937.

II. CHARGE.

I continued to be in charge of the section as Government Entomologist throughout the year under report.

III. ENQUIRIES.

During the year under review 389 enquiries were received by the section from different parts of the Presidency. These referred chiefly to insect pests of crops and bee-keeping. In addition to those received by the section, the Entomological Assistants posted in the districts under circle officers also dealt with a number of enquiries.

IV. SPECIAL INVESTIGATIONS.

A short account of the investigations undertaken during the year is given below. Special attention was paid to the study of control methods for some of the more important crop pests in this Presidency.

1. *Sugarcane pests—Diatræa venosata.*—A good deal of interesting data have been collected regarding this pest of canes. Eggs are laid on the upper surface of cane leaves along the mid-ribs and the just hatched larvæ enter the central whorl of leaves and scrape the green matter in longitudinal patches. After some days the caterpillars enter the heart of the shoot and feed on the contents. Pupation takes place outside the larval gallery between the stem and the leaf sheath. Extent of damage to canes was worked out in different localities.

Scirpophaga.—Studies on Scirpophaga were continued. The incidence of the pest in certain localities was as high as 28 per cent. Several larval parasites, viz., *Stenobracon nicevillei* Bingh, *S.deesæ* Cam., *Rhaconotus scirpophagæ* Wlk., *Rhaconotus* n.sp., *Elasmus zehntneri* Ferr., *Goniozus* n.sp., and *Shirakia* sp. have been collected of which detailed studies were made of three. Regarding the species of Scirpophaga present in South India it was found that both the spotted (*monostigma*) and spotless (*auriflua*) forms were got from the progeny of either.

Control experiments for borers.—Experiments were started to see whether the treatment said to be successful in Mysore was effective under Coimbatore conditions. When the plants were four

to five weeks old the following treatments were given :—(1) removal of basal leaf sheath, (2) earthing up of young canes so as to cover the basal leaf sheaths accompanied by a good irrigation, (3) combination of (1) and (2). These treatments together with the control were replicated thrice. In the first and second counts earthing up and basal leaf sheath removal plus earthing up gave least infestation. The final count will be taken at the time of harvesting the canes.

Mealy bugs.—There are two species of mealy bugs attacking the stems of which one is *Ripersia sacchari.* Dipping the cane setts in Crude oil emulsion and Fish oil rosin soap before planting has been tried on a small scale but the results have not been quite satisfactory. This will be repeated with the addition of a few other treatments. Two species of mealy bugs were noted for the first time on cane roots.

2. *Cotton pests—Cotton bollworms.*—During the year under review detailed studies were made of the alternate host plants of the bollworms. (1) *Abutilon hirtum*, (2) *A. indicum*, (3) *A. crispum*, (4) *Hibiscus panduraiformis*, (5) *H. vitifolius*, (6) *H. esculentus*, (7) *H. rosasinensis*, (8) *Pavonia corea*, (9) *Malvastrum coramandelium*, and (10) *Althea* sp. were examined at various periods. Of these, 1, 2, 5, 7, 9 and 10 carried infestations of both *Earias fabia* and *E. insulana.* Hibiscus esculentus and H. vitifolius carried a heavy infestation of Earias fabia the incidence being as high as 33 per cent and 15 per cent respectively. *Platyedra gossypiella* caterpillars have been collected for the first time from Hibiscus esculentus pods. Incidence studies of bollworms in the shed buds and bolls of Cambodia cotton in a plot of 20 cents showed that infestation by Earias ranged from 55 to 48 per cent in the middle of December but dropped to 4 to 7 per cent in the middle of January. Platyedra infestation occurred as early as the first week of December but seldom exceeded 1·5 per cent. The following parasites were reared from the bollworm caterpillars. (1) *Microbracon lefroyi*, (2) *Microbracon greenii*, (3) *Bassus* sp., (4) *Melcha nursei*, (5) *Bhogas testaceous*, (6) *Chelonus* sp., (7) *Actia hyalinata*, (8) *Desmemetopa* sp.(?) and (9) *Elasmus johnstonii* from Earias and *Gonlozus* sp. from Platyedra.

The results of the examination of green bolls from Cambodia cotton in the Central Farm and the Anamalais in January–February were as follows :—

Central Farm—Platyedra 17·8 per cent and Earias 2·8 per cent.

Anamalais—Platyedra 8·1 per cent and Earias 3·6 per cent.

Tarache notabilis.—A severe outbreak of these caterpillars was noticed on cotton seedlings about a month old in the Cotton Breeding Station in October. Prompt handpicking and destruction of caterpillars reduced the severity of attack. The pest would appear to go through long cycle pupal stages immediately.

Observations were also made on the cotton scale (*Saissetia* sp.) and the cotton jassids (*Empoasca devastens* and *E. formosana*).

3. *Paddy pests—The paddy stem borer* (*Schœnobius incertellus us*).—Seasonal studies of the fortnightly plantings at the Paddy Breeding Station were concluded. The results of the studies of the 86 strips are being tabulated and the figures analysed with a view to getting the relationship, if any, between the weather factors and infestation at different stages of the crop.

In the Central Farm, light trap trials against the paddy stem borer were continued. Petromax (200 candle power) light was used for two hours from 7 to 9 p.m. for 70 days. The variety of paddy under trial was G.E.B. 24. The figures of infestation at the earhead stage have shown that the effect of light trap is felt most at a range between 60 and 130 yards from the light as measured by the percentage of infestation. Some experiments have been started during the year to study the effect of the traps during the earlier stages of the crop also.

The Army worm of paddy (*Spodoptera mauritia*).—Studies on the pest were directed to note the peculiarities, if any, during the larval or pupal period of the insect under natural conditions during the different parts of the year. So far, no sign of the æstivation or hibernation was noticed. In this connexion, the allied cutworms —*Cirphis* sp. collected on grasses from Hosur were also under special study.

4. *Pests of fruit trees—Fruit flies.*—Two fruit flies—*Carpomyia vesuviana* and *Dacus correctus* were studied in detail. Both are pests of ber fruits at Panyam and Coimbatore. The results of the studies during the year have shown that the former is not known to feed on any fruits other than ber and has no attraction to lures. The latter has a range of food plants such as sandal fruits, pumpkin flowers, guavas and oranges and has an attraction for *Clensel*. Raking up the soil to expose the pupæ and spraying poisoned molasses are effective in reducing both these pests. In addition, Dacus correctus flies can be attracted to Clensel and killed in numbers.

As a result of intensive collections three more fruit flies—*Sphenixomyia* sp., *Dacus persicæ* and *Euphrenta* sp. have been added to the list of South Indian Trypetidæ.

Virachola isocrates.—Studies of this pest of pomegranates were continued. The pest appeared in March–April and subsided by the end of June. The incidence of the caterpillar was very low at Coimbatore during the year. Control experiments have indicated that spraying of Lead arsenate, Crude oil emulsion and cutting away calyx cups have some effect in reducing the infestation. While the control trees showed an attack of 14 per cent the trees sprayed with Lead arsenate showed only 4 per cent and those

sprayed with Crude oil emulsion and those that had their calyx cups removed showed each 6 per cent. The pest has been noted to breed in guava fruits and soapnuts (*Sapindus* sp.).

5. *Tobacco pests—Laphygma exigua.*—Investigations on this pest of tobacco nurseries at Chirala were continued. Ragi (*Eleusine coracana*) raised in long narrow strips on the edges of the tobacco plots was successful as a trap crop. The moths showed a preference to ragi for laying eggs. There was very heavy egg laying on the tender ragi seedlings which continued to be attractive for a period of five days from the date of germination. It was found by actual counts that ragi ceased to be attractive to the caterpillars 12 days after germination, and the caterpillars showed a definite tendency to migrate into the tobacco beds. A systematic handpicking of egg masses on ragi resulted in the removal of 2,887,960 eggs from an area of 54 acres. Handpicking of caterpillars which emerged from missed egg masses on ragi and spraying of arsenical poisons against caterpillars which escaped to tobacco seedlings were also helpful in controlling the pest.

6. *Pests of chillies—The chillies thrips* (*Scirtothrips dorsalis*).—Sulphur and tobacco dusting trials were made to test the efficacy of each against the chillies thrips and how far each gave an economic return. The two treatments and the control were replicated 6 times. Each experimental plot was 1·91 cents. Three dustings were given in all but the two latter were rendered ineffective by rains that were received immediately after. From the toxic point of view both tobacco and sulphur dust appeared equal but the former gave better yields than the latter. The experiments will be repeated to confirm the results of the trials.

7. *Coconut pests—The coconut beetle* (*Oryctes rhinoceros*).—Observations on the life history and bionomics of the pest under field conditions were continued and some additional information on the longevity and egg-laying capacity of the beetles gathered. The beetle attack to the palms was noticed throughout the year and the maximum number of beetles were found in March–April. Control methods tried included (1) systematic hooking out and removal of beetles from palms and filling the holes with sand preventing further entry of beetle, and (2) use of the parasitic Green Muscardine fungus against beetle grubs. The trials so far made on the activity of the fungus in pots as well as in field pits have indicated, (1) that the fungus is able to fatally attack the larvæ and pupæ, (2) that the eggs are practically unaffected and are able to hatch out in the inoculated material, (3) the adult beetles too continue to thrive and lay eggs in the same but the young resulting grubs get affected, and (4) under wet land conditions the attacked specimens were noted in the course of about two months but in the case of drier areas, the fungus was slow to show its activity in the pit. Further trials are being made in other localities such as Taliparamba, Nileshwar and Aduthurai.

8. *Cholam pests—The Earhead bug* (*Calocoris angustatus*).—Observations were made of the cholam earhead bug. Dusting of sulphur was tried as an experiment against the pest. There were in all six treatments, viz., (1) one dusting immediately after the emergence of the earhead, (2) one dusting on the fourth day after emergence, (3) one dusting 8th day after emergence, (4) same as 1 but with a second dusting with six days interval, (5) same as 2 but with a second dusting with 6 days interval, and (6) same as 3 but with a second dusting with 6 days interval. These together with the control were replicated four times. Each experimental plot measured two cents. The crop was sown on 25th March 1937 and harvested on 21st/22nd June 1937. There were two counts of adults and nymphs for all the treatments. The pest incidence during the season was very light. Nevertheless the treatments on the 8th day after emergence of earheads gave constantly lower population counts and higher yields but the yield figures are not significant seeing that the pest incidence was light. On an average 40 lbs. of dust were necessary for giving one round for an acre and the cost of the treatment including labour charges came to Rs. 5–4–0.

9. *Moringa pests—Stictodiplosis moringæ*.—This Cecidomyiad pest of moringa buds was studied in detail during the year. The female fly selects buds about 4 to 10 mm. long for oviposition. The maggots feed on the internal tissues and as a result of the attack the bud shrinks and ultimately drops down. The maggots come out and make cocoons of sand with a slight lining of silk and pupate inside them. The life cycle of the fly from egg to adult is 12–19 days. Bordeaux mixture was tried as a repellent but did not show any good effect. Working up the soil underneath the tree to destroy the pupæ can be suggested as a method of control.

Noorda moringæ.—This is a major pest of moringa buds the incidence in some cases being as high as 78 per cent. The caterpillars first feed on the anthers and later the other contents of the bud. Only one caterpillar is found inside a bud. When the attacked buds drop down the caterpillars come out and enter the soil and pupate in light cocoons. The life cycle of the pest is about 24 to 28 days. As in the case of *Stictodiplosis moringæ* the soil underneath the trees can be raked up to destroy the pupæ.

10. *Cabbage pests—The diamond back moth* (*Plutella maculipennis*).—The life cycle of the pest under Coimbatore conditions is about 15–18 days. Dusting with pyrethrum powder was tried against the caterpillars and found to be effective. Detailed studies of the two parasites—*Brachymeria excarinata and Tetrastichus sokolowskii* were made. Of the two parasites, Brachymeria attacks the pupæ and Tetrastichus the larvæ. The attacked larvæ however turn into pupæ the next day.

11. *Castor pests—The castor mite (Tetranychus telarius).*—Life history studies of the mite were completed. Eggs are laid by the female mite on the under surface of the leaves. In 3–4 days the tiny larvæ come out and begin to feed on the leaves. After the first moult they become nymphs and after two more moults become adults. The complete life cycle occupies 10–12 days. The maximum longevity of a mite was noted to be 16 days and a female laid as many as 75 eggs. Dusting with flowers of sulphur and spraying with lime sulphur were tried as control measures. It was found that both the dusting and spraying were effective against the mites, but the former was better as the larvæ which hatched out of the eggs already found at the time of dusting were also affected.

The Castor semilooper (Achœa melicerte).—There was a severe outbreak of this pest on castor in one of the Central Farm fields and advantage was taken of this to make observations on the different stages of the pest and its natural enemy—*Microplitis maculipennis.*

12. *Pests of stored products.*—Observations on the grain beetle —*Rhizopertha dominica*—were made during the year. Laboratory tests towards preservation of cholam from *Calandra* attack have shown that grains mixed with Borax and Copper carbonate prevent the entry of beetles while lime plus Creosote, Copper carbonate and Sodium fluosilicate appear to check their multiplication. Trials with cholam grains mixed with soapnut (Anacardium), Acorus rhizomes, leaves of neem, Ocimum, Pongamia, etc., have been started to find out how far this treatment prevents insect attack. Acorus and neem leaves have so far given better results. Studies are in progress.

13. *Insecticidal trials—Toxic studies of tobacco stem infusions.*—Till now decoction was prepared from tobacco waste. Our studies during the year have shown that decoction can be prepared from tobacco *stems* and this even at dilution of 1 :3 is effective against cotton sphis. The use of tobacco stems therefore reduces the insecticidal bill to a great extent.

The following insecticides received from different firms were tried as time permitted :—Keep Green, Floral, H. G. Ionised Insecticide, Lethalate Nicolate, Dry Pyrocide, Rubicide, N.N.K. Liquid, Liquid Tomino, Liquid Sulphur, Pyrethrum powder, Calcium and Lead arsenates, Emulsion Derrisol, ' Karpooravalli,' Multicide, Vesfume, Naaki and Extermite. Calcium arsenate and Lead arsenate mentioned above were received from a Japanese firm and the price quoted was 2 and 4 annas respectively per lb. as against the European stuff costing 12 annas and Rs. 1–8–0 respectively. Our trials have shown that these stomach poisons are as effective as those got from Europe.

14. *Chemotropic response of insects.*—A few field experiments were conducted during the year. Citronella oil, Vinegar, Kerosene, Benzaldehyde, Acetic acid, Lactose, Dextrose, etc., were exposed in glass dishes in Minnesota traps to note the attraction of insects to these chemical substances. The insects trapped were collected and are being studied. According to Dr. Imms in chemotropism we should seek for new and effective measures for combating insect enemies.

V. Life History Studies and Pest Control Work at Headquarters.

At the Insectary, in charge of the Assistant Entomologist, Mr. T. V. Subrahmaniam, the habits and life histories of various insects collected by the staff both at headquarters and outside while on tour were studied.

Pest control work was attended to on the Central Farm and the breeding stations. The important pests, which were treated were—the citrus leaf miner; mealy bugs on guava; Epilachna on brinjals; scales on sapota; aphis on citrus, cowpea, cotton, mango; the castor semilooper; Papilio caterpillars on citrus Aleurodids on pomegranates; Psyllids on curry leaf; mites on ragi; Aulacophora beetles on cucumber; and thrips on paddy.

VI. Bee-keeping.

Bee-keeping as a cottage industry is gaining rapid popularity. Numerous enquiries on the subject are being received from different parts of the Presidency and also from other provinces and states in India. Work in connexion with beekeeping during the year showed considerable progress.

Apiary.—The Apiary at Coimbatore was the centre of attraction to numerous visitors interested in this industry. An average strength of about 40 colonies was maintained throughout the year. The condition of the colonies was satisfactory in April and May due to favourable weather and pasturage conditions. But with the advent of South-west monsoon and the following windy weather there was a decline in the colonies. The scanty showers received during September, October and November were, however, helpful in reviving the colonies. The subsequent droughty conditions and the resulting scarcity of pollen and nectar gave a set back to the activities of the bees till the end of the year. Generally speaking the season was not quite satisfactory for bee-keeping.

Research.—A new line of observations on the behaviour of bees in relation to weather and pasturage conditions was started in November. Some interesting information on the fluctuation in the activity of the bees, hourly and daily fluctuations in the weight of

colonies under different conditions, influence of weather on the secretion of nectar in plants, time of visit of bees to different flowers, etc., was obtained. It is proposed to continue this study till next October. A Braconid parasite (*Apanteles galleriæ*) was for the first time noted on the wax moths. The total life cycle of the wasp ranges from 16–22 days and the maximum longevity 27 days. Detailed studies on the parasite to see whether it is useful for the biological control of the wax moth are in progress. The study of the Tenebrionid beetle pest of wax received some attention. Attempts were made to adopt Demarree method of swaram prevention for the Indian bees but the pasturage and weather conditions were not conducive to such studies.

A report of what appears to be a disease of bees was for the first time received from Madras during August. In some respects the disease symptoms noticed were similar to those of 'Sacbrood' prevalent in the West but there were also differences. The experts in foreign countries are being consulted in the matter. It is reported, however, that the colonies infested with the disease at Madras have subsequently recovered. In case the disease shows itself again detailed studies will be undertaken.

Propaganda.—Considerable propaganda work was done both by the Entomological Section and the district staff. Apicultural exhibits were sent to most of the important exhibitions and fairs in the Presidency. The usual short course in bee-keeping was held in February. Fifteen students in all—mostly sons of farmers—from various parts of the Presidency attended the course and they were given a thorough training, especially in the practical aspects of the subject. To give a further stimulus for the spread of this cottage industry a "*Honey Week*" was organized by the section for the first time on a Presidency basis in April. Demonstrations in bee-keeping were given throughout the week in different centres of the Presidency. Bee colonies and apicultural appliances were on sale. A bee-keeping exhibition (vide photo) was arranged at the Insectary at Coimbatore and the Honey Week was inaugurated by the Principal on the 24th April 1937. The reports received from the district officers have shown that the Honey Week was a success and served the useful purpose for which it was organized.

VII. Eri Silkworm Rearing.

Rearing of eri silkworms was continued throughout the year for supplying eggs to different rearers. As a result of enquiries in different parts of India it has been possible to find a market for Eri cocoons. Messrs. Haribux Lachminarayan, Fancy Bazaar Gauhati, Assam, are willing to purchase pierced cocoons at the rate of Rs. 60 per maund (82 lb.), Gauhati delivery. The freight charges from Coimbatore to Gauhati come to Rs. 9 by goods train.

VIII. Fumigation and Quarantine work.

During the year, 75 lots including seeds, live plants, cuttings, suckers, etc., were received from different parties. They were examined for pests, fumigated where necessary and pest free certificates issued. Samples of tamarind intended for export to Egypt from Madras Port were examined from time to time by the Government Mycologist and myself and certificates issued. This is a new item of work. At the request of the Cotton Specialist his field laboratory was fumigated with Calcium cyanide.

IX. Systematic studies and Collections.

Systematic work in Acarina, Coccidæ, Braconidaæ, Chalcidæ, Ichneumonidæ, Pyralidæ and Noctuidæ showed considerable progress. A note on the more important of the Hymenopterous parasites collected recently is being prepared.

Eleven consignments of insects were sent for identification to the Imperial Institute of Entomology, London, of which seven were received back identified. In addition to those sent previously, four consignments were sent to the Bureau of Entomology, Washington and eight were received back. One consignment of Tingitids was sent to Professor Drake of Iowa. Our thanks are due to all these specialists. Besides these, several consignments of insects received from the Entomological Assistants in the districts were duly identified and sent back. Specimens of Leucospids and Xylocopas were sent to the Indian Museum for study by Mani and Tsincho Ma of China respectively. Various insects were also sent to the Imperial Entomologist and the Director, Zoological Survey of India, on request.

The insect collections at Coimbatore are now thirty years old and contain some very valuable specimens of types and paratypes of South Indian insects and must be considered a national asset. It is very essential that provision should be made for the proper upkeep of collections and systematic work by reviving the retrenched post of the Systematic Assistant Entomologist.

X. Entomological work in the districts.

The Entomological Assistants stationed in the districts under circle officers attended to over 500 enquiries most of which referred to pest control. Observations on insect pests peculiar to the locality were also made as time permitted. They also did propaganda work in beekeeping and were in charge of exhibitions and pest act operations.

XI. Scientific papers prepared and published.

A. The following papers were published during the year :—

(1) " Practical hints on beekeeping " by M. C. Cherian and S. Ramachandran, published in the Madras Agricultural Journal, May 1937.

(2) " Role of Insects in Rural Reconstruction " by M. C. Cherian, published in the Madras Agricultural Journal, October 1937.

(3) " Preliminary studies on the freckled yellow and stripe disease of cholam " by M. C. Cherian and M. S. Kylasam, published in the Proceedings of the Association of Economic Biologists, Volume IV.

(4) " Studies on *Elasmus zehntneri* Ferr—a parasite of the sugarcane white moth borer (*Scirpophaga*) " by M. C. Cherian and P. Israel, published in the Madras Agricultural Journal, September 1937.

(5) " A new Cecidomyiad pest of Moringa " by M. C. Cherian and Mohamed Basheer, published in the Madras Agricultural Journal, March 1938.

(6) " Studies on *Stenobracon nicevillei* Bingh—a parasite of the sugarcane white moth borer (*Scirpophaga*) " by M. C. Cherian and P. Israel, published in the Bulletin of Entomological Research, London, March 1938.

B. The following papers prepared during the previous years were sent for publication :—

(1) " Mite (Acarina) pests of crops in South India and methods for their control " by M. C. Cherian, Agriculture and Livestock in India, Delhi.

(2) " Notes on the life history and habits of *Dacus brevistylus* a pest of *Coccinia indica* fruits " by M. C. Cherian and C. V. Sundaram, Indian Journal of Agricultural Science, Delhi.

(3) " Studies on the white moth borer of cane (*Scirpophaga*) in South India " by M. C. Cherian and C. K. Subramaniam, Proceedings of the Association of Economic Biologists, Coimbatore.

(4) " Studies on *Brachymeria excarinata* a pupal parasite of *Plutella maculipennis* " by M. C. Cherian and Mohamed Basheer, Proceedings of the Indian Academy of Sciences, Bangalore.

(5) " Short notes on *Metanastria hyrtaca* " by T. V. Subramaniam and K. P. Anantanarayanan, Journal of the Bombay Natural History Society, Bombay.

(6) " *Semiothisa* (*Macaria*) *pervolqata*—a Geometrid pest of Daincha (*Sesbania aculeata*)" by M. C. Cherian and B. Rangiah Pillai, Madras Agricultural Journal.

(7) " Studies on *Laphygma exigua* and its natural enemies " by M. C. Cherian and M. S. Kylasam, Bulletin of Entomological Research, London.

C. The following papers prepared during the years are awaiting publication :—

(1) " Studies on the coconut beetle (*Oryctes rhinoceros*) in South India " by M. C. Cherian and K. P. Anantanarayanan.

(2) " *Rhaconotus scirpophagæ*—a parasite of the sugarcane white moth borer " by M. C. Cherian and P. Israel.

(3) " Notes on a Braconid parasite (*Apanteles galleriæ*) of the wax moth " by M. C. Cherian and S. Ramachandran.

Of these papers mentioned above, Nos. 5 in A, 6 and 7 in B and 1-3 in C were presented at the Silver Jubilee session of the Indian Science Congress held at Calcutta in January 1938.

XII. Miscellaneous.

1. *Artists' section.*—The Artists' section continued to be under my charge throughout the year under report. The following items of work were attended to during the year : pen and ink drawings 298 ; paintings 378 ; labels 370 ; photographs 456 ; microphotographs 278 ; prints 2,224 ; lantern slides 827 ; and poster enlargements 528. Messrs. S. S. Subramania Ayyar and M. Singara Royan were on tour to Koilpatti and Hosur, respectively, for painting and photographic work as desired by the Superintendents of the stations.

2. *Exhibitions and shows.*—Beekeeping appliances, colored posters, bromide enlargements, show cases of insects, etc., were sent to exhibitions and shows in different parts of the Presidency.

3. *Special lectures.*—As desired by the Principal, a lecture on " Some insect families of economic importance in South India," was delivered to the students of the I and II year B.Sc. classes. In the absence of the Assistant Lecturer in Entomology on other duty, assistant Sri K. P. Anantanarayanan helped the Lecturer in Entomology in conducting practical classes for a month.

4. *University examination in Agriculture.*—I acted as Examiner in Agricultural Zoology for 1938 as kindly permitted by Government.

5. *Entomological meeting at New Delhi.*—I attended a meeting of the Entomologists convened by the Imperial Council of Agricultural Research in November 1937 to discuss the sugarcane pests scheme. I also attended the meeting of the Advisory Board.

6. *Sectional meetings.*—Monthly meetings of the scientific staff of the section have been arranged from the beginning of the calendar year. Such meetings serve a useful purpose in bringing together the staff for discussion of various scientific problems tackled by them.

M. C. CHERIAN,
Government Entomologist.

ADMINISTRATION REPORT OF THE GOVERNMENT MYCOLOGIST FOR 1937–38.

(ABRIDGED REPORT.)

Charge.—I was in charge of the Mycological section and the Microtome sub-section throughout the year. There was no change in staff.

I. MYCOLOGICAL INVESTIGATIONS.

The following are the more important investigations done during the year.

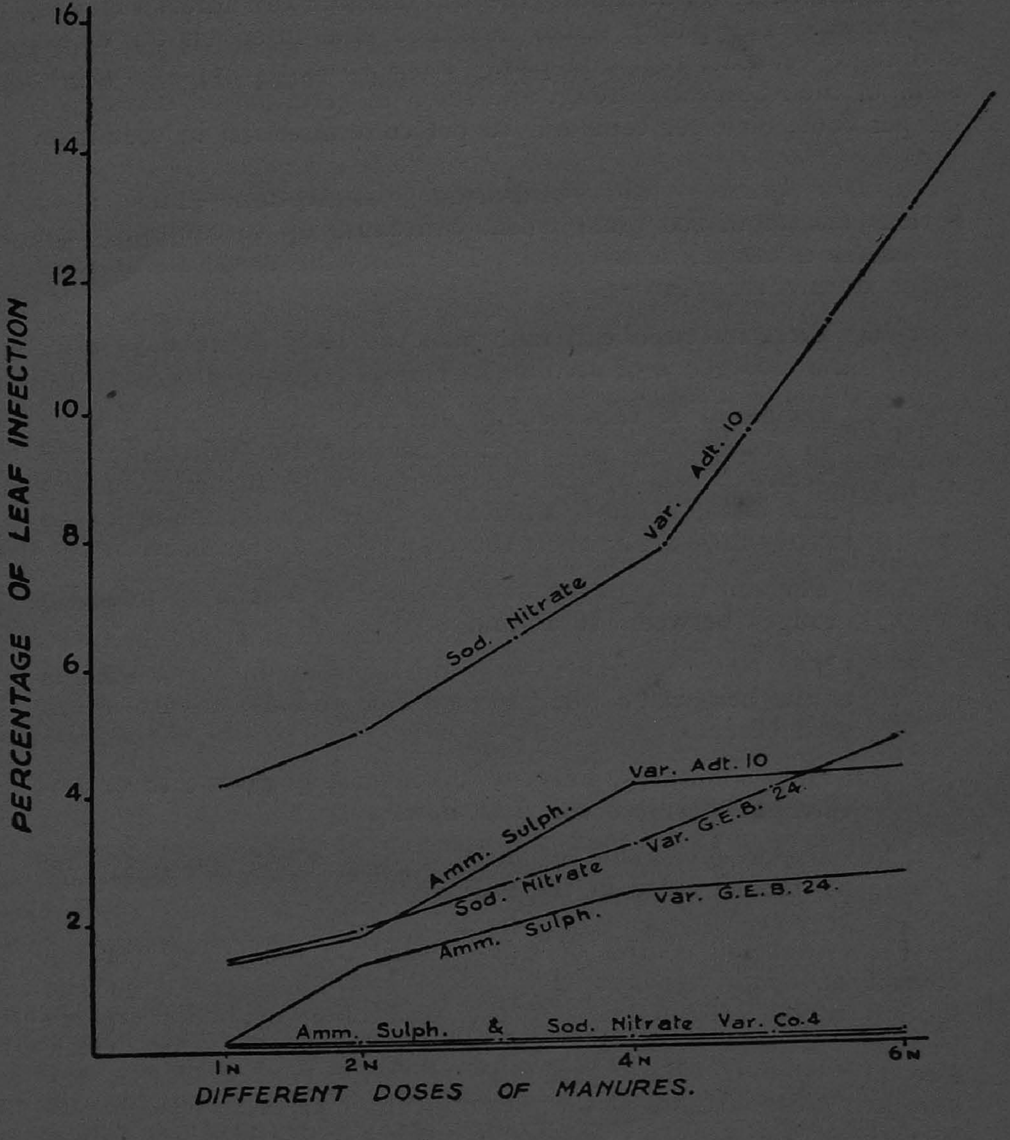
1. *Paddy—'Blast'—Piricularia oruzae—(a) Disease resistance.*—Wound inoculations on two resistant and two susceptible strains of paddy produced characteristic lesions of 'blast' showing that the resistance of certain varieties of paddy to Piricularia is not a case of physiological immunity. pH values of the sap of these strains did not show sufficient variation to correlate disease resistance with pH of the sap.

(*b*) *The effect of nitrogenous manures on 'blast'.*—A pot culture experiment was done with three varieties of paddy, viz., Adt. 10, G.E.B. 24 and Co. 4 to study the effect of nitrogen on the disease. Nitrogen was applied in the form of ammonium sulphate and sodium nitrate in units of 40 lb. of N per acre. The series consisted of four treatments, viz., 1 N, 2 N, 4 N and 6 N and each treatment replicated five times. The results are plotted in the graph printed on page 149.

The results indicate that increasing quantities of nitrogen applied as manure tend to increase the disease in susceptible varieties. For equal quantities of nitrogen, sodium nitrate induces greater susceptibility than ammonium sulphate. While susceptible varieties take more disease with heavier doses of nitrogen, the highly resistant variety Co. 4 remains unaffected.

(*c*) *The disease in relation to period of sowing.*—In August sowings, the late flowering varieties suffered less than the early flowering varieties. Those which flowered in October and November were more subject to disease than those which flowered in December and January. From a study of the weather data, this difference is attributable to more frequent rainfall, more cloudy days and increased relative humidity.

2. *Helminthosporiose of cereals (Helminthosporium spp.).*—This class of fungi causes seedling blight, leaf-spot and ear-blight and takes a heavy toll of cereal crops. Three isolations were



PERCENTAGE OF LEAF INFECTION
16
14
12
10
8
6
4
2
Sod. Nitrate Var. Adt. 10
Var. Adt. 10
Amm. Sulph.
Var. G.E.B. 24.
Sod. Nitrate
Var. G.E.B. 24.
Amm. Sulph.
Amm. Sulph. & Sod. Nitrate Var. Co.4
1N
2N
4N
6N
DIFFERENT DOSES OF MANURES.

made, viz., those from wheat, ragi and paddy. The cultural study of the three fungi showed great variation in the morphological and physiological characters such as size of conidia and septation, rate of growth, etc., showing that all the fungi are different from one another.

Parasitism.—Inoculation experiments showed that besides each fungus attacking its own host, the wheat strain can infect ragi and *vice versa.* The paddy strain does not take infection on wheat and ragi. Wheat, ragi and paddy seeds soaked in spore suspensions of their respective fungi and sown in germination trays gave 84 per cent, 85·5 per cent and 79 per cent infection in seedlings.

3. *Red gram—' Wilt '*—Fusarium vasinfectum.—This is a serious disease of red gram which can cause up to cent per cent disease in a badly infected field. The following observations were made during the year :—

(1) First infection can take place as early as 18 days after the emergence of seedlings.

(2) Incidence of wilt steadily increases from the fifth week and reaches the peak period between the thirteenth and fifteenth weeks which synchronizes with the reproductory phase in the plants. Thereafter there is a decline up to the twenty-first week when the crop is ready for harvest.

(3) The soil temperature at the period of maximum infection ranges between 70°F and 80°F.

(4) The fungus works its way up the stem up to two-thirds of the height, but the pods are free and the disease is not seed borne.

(5) In pot cultures, infected soil invariably gives rise to disease but sterilized soil does not.

(6) Under favourable conditions, dead roots produce the perithecial stage in the soil.

Field trials on control of wilt.—Based on the analogy of the control of cotton root-rot (*Phymatotrichum omnivorum*) in the United States of America, by the application of bulky organic manures, an experiment was laid out in field No. 7 of the Cotton Breeding Station. Farm-yard manure at the rate of 15 tons per acre and green manure at the rate of 30 tons per acre were buried in trenches six weeks in advance of sowing. The idea was to see whether by encouraging the growth of soil organisms in the trenches, they would exercise the phenomenon of ' biologic antagonism ' on the wilt fungus and stifle its growth. The following table which summarizes the results shows that organic manures do not produce the beneficial effect expected of them.

Redgram wilt percentage of deaths in different treatments (from sowing to harvest).

Treatment.	Replicates. (1)	(2)	(3)	(4)	(5)	(6)	Total (1 to 6).
A. Green manure ..	85·94	87·18	99·15	98·24	99·13	95·28	564·92
B. Cattle manure ..	100·00	92·15	97·57	100·00	100·00	93·70	583·09
C. No manure ..	99·08	99·17	100·00	93·61	100·00	19·55	511·41
Total (A to C) ..	285·02	278·50	296·72	291·85	299·13	208·53	1,659·42

4. *Areca palm—' Mahali'* (*Phytophthora arecæ*).—The study of this disease which was taken up afresh last year was continued. The problems awaiting solution were the following :—

(1) The relative efficacies of single and double spraying.

(2) Is 2 per cent Bordeaux mixture more advantageous than 1 per cent Bordeaux mixture?

(3) The relative merits of different ' stickers ' and ' spreaders ' added to Bordeaux mixture.

Extensive field experiments involving 16 different treatments were carried out in South Kanara. The summarized results of these experiments are given in the table below :—

Treatment effects on infection per plant in Vittal and Kandigai.

Treatment combinations. Mixtures used.	Adhesive per 100 gallons.	Number of sprays.	Percentage of infection per tree.	Unit of 10 plants in the mean.
Bordeaux mixture 1 per cent.	Resin soda (8 lb. + 4 lb.)	2	5·8 *	2
	Casein (2 lb.)	2	2·5 *	3
	Coconut oil (½ gallon) ..	2	0·7 *	3
Bordeaux mixture 2 per cent.	Resin soda (8 lb. + 4 lb.)	2	5·4 *	4
	Casein (2 lb.)	2	8·8	3
	Coconut oil (½ gallon) ..	2	2·9 *	3
Bordeaux mixture 1 per cent.	Resin soda (8 lb. + 4 lb.)	1	32·0	4
	Casein (2 lb.)	1	12·5	3
	Coconut oil (½ gallon) ..	1	17·0	2
Bordeaux mixture 2 per cent.	Resin soda (8 lb. + 4 lb.)	1	6·3 *	2
	Casein (2 lb.)	1	3·3 *	3
	Coconut oil (½ gallon) ..	1	2·2 *	1
Bordeaux mixture 2 per cent.	Fish oil resin soap (10 lb.).	2	7·0 *	3
Cuprous oxide 1 per cent.	Casein (2 lb.)	2	14·6	4
Bordeaux mixture 2 per cent.	Niger oil (½ gallon) ..	2	2·5 *	3
Bordeaux mixture 2 per cent.	Without adhesive ..	2	2·8 *	3
Control	No spraying	..	34·9	3

* Effective treatments not significantly different from each other.

N.B.—For the double spraying series the first spraying was given between the 23rd and 30th May and the second spraying between the 23rd and 30th July 1937. For the single spraying series the spraying was given between the 3rd and 8th July 1937. The monsoon in 1937 was particularly late as it commenced only on the 10th June.

Analysis of variance of treatment effects on Mahali infection in Vittal and Kandigai experiments.

Variations due to.	Degrees of freedom.	Sum of squares.	Mean square.
Between treatments	16	5, 26, 99·89	3,293·7
Remainder	28	2, 31, 72·36	..
Between plots	44	7, 58, 72·25	..
Within plots	445	13, 63, 75·39	306·48
Total	489	21, 22, 47·64	..

P. > ·01

The treatment effects are significant.

The following are the inferences from the above results :—

(1) The control plots show the heaviest infection.

(2) Cuprous oxide is a poor substitute for Bordeaux mixture.

(3) Two sprays exercise better control than a single spray.

(4) Two per cent Bordeaux mixture is more efficacious than 1 per cent mixture.

(5) Vegetable oils and casein function as good spreaders with 2 per cent and 1 per cent strengths of Bordeaux mixture.

(6) Taking all the treatments together, oils and casein are better spreaders than resin.

These results are particularly valuable since resin which was originally recommended by the department as an adhesive and the preparation of which involved a lot of time and patient labour could now be replaced by vegetable oils or casein both of which are at once more efficient and easier to manipulate than resin. The good results obtained from plain Bordeaux mixture opens the question whether spreaders and adhesives could entirely be dispensed with. It is proposed to conduct further experiments during the ensuing season to throw light on this point as also on other points, e.g., the possibility of economizing on the cost of chemicals by the substitution of a 1 per cent mixture for the 2 per cent mixture now recommended for the pre-monsoon spray.

5. *Glœosporium blight of arecanuts.*—A new disease affecting the inflorescences and nuts of areca palms was recorded last year from South Kanara. The disease has since been found to be prevalent in parts of Coimbatore taluk. The disease causes spots on leaves, leaf sheaths, peduncles and pedicels, shedding of tender nuts and partial drying up of bunches. A field experiment was started in January at Semmedu to test the effect of Bordeaux mixture on the disease. After preliminary trials which showed that the mixture has no deleterious effect on freshly emerged flower bunches, two hundred trees were selected at random and the following treatments are under trial :—

(1) Spraying immediately after emergence—50 trees.

(2) Spraying one week after emergence—50 trees.

(3) Spraying three weeks after emergence—50 trees.

(4) Control—50 trees.

This experiment is still in progress.

6. *Horsegram wilt*—Macrophomina phaseoli.—The following are the results of the study of the fungus in the laboratory :—

(*a*) The fungus tolerates a wide range of pH from 3·04 to 7·97. The optimum for growth ranged between 5·17 and 8·04. With the growth of the fungus an acid medium becomes less acid and an alkaline medium becomes less alkaline so that both eventually fluctuate slightly near pH 7.

(*b*) The thermal death point of sclerotia lies between 55° and 56°C.

(*c*) The fungus produces saltations in Waksman's liquid medium.

(*d*) The fungus filtrate does not exert any appreciable toxic effect on the host plant.

(*e*) *Trichoderma lignorum* exerts an inhibitory influence on the growth of this fungus. When grown together in a Van. Tieghem cells, the hyphae of Macrophomina were emptied of their protoplasmic contents.

(*f*) The pycnidial form is found in cultures grown on a variety of agar media.

7. *Citrus diseases*—(*a*) *Bark rot and 'water injury' in Kistna delta.*—*Citrus maderaspatana* Tanaka, a bitter-sweet variety grown round about Bezwada was reported to be subject to a serious disease. Trees which are in apparently good health and bearing heavily are found to wilt away within the space of a week, with the leaves and the immature fruits dropping from them. The growers originally attributed the trouble to the proximity of some tanneries to their gardens. This belief, however, proved unfounded since the disease was found in gardens several miles away from tanneries. An investigation of the disease revealed the following facts :—

On pulling away the soil from the trunk of dying trees, a complete ring of injured bark is detected. Trees with one or two patches of healthy bark bridging the ring, remained apparently healthy in spite of extensive injury on other sides. The root system was partially or completely attacked and the wood was stained black. The feeding roots were sparse and looked unhealthy, the cortex of such roots sloughed off easily from the woody core.

Three fungi were isolated from dead trees, viz., (1) *Diplodia sp.*, (2) *Sporocybe hybrida nov. sp.* Mason and (3) *Haplosporella sp.* Of these *Diplodia* is constantly associated with dead stumps and a fungus of the same genus—*Diplodia natalensis*—is recorded to be parasitic on citrus trees. The other fungi are not known to be parasitic. Inoculation experiments with the *Diplodia* on young citrus plants were unsuccessful. Many species of *Diplodia* are, however, known to be wound parasites which can attack roots which are depleted of carbohydrates. Since the ring of dead bark

at the collar of these trees prevents the translocation of carbohydrates to the roots, it appears probable that the root system of these trees become susceptible to the invasion of Diplodia and other weakly parasitic organisms. Some physiological studies were done with *Diplodia sp.* and *Sporocybe hybrida.* Diplodia tolerates a pH range of 4·5 to 8·2. The optimum is in the region of 5·5 pH. The fungus does not grow in sterilized soil extract nor in sterilized and unsterilized soil. It grows sparsely in sterilized tannery waste water, but makes profuse growth on sterilized leaf mould and sterilized cattle manure. It is not inhibited by *Trichoderma lignorum*, on the other hand, *Trichoderma* is overrun by Diplodia. The optimum relative humidity for this fungus at laboratory temperature is at 85 to 95 per cent. The thermal death point of spores lies between 55° and 57°C at ten minutes exposure. In liquid cultures of various initial pH values, there was a gradual shift of reaction towards an alkaline range. The optimum pH for the growth of *Sporocybe hybrida* was an alkaline range of pH 8·04.

Control.—The soil conditions and the system of cultivation practised in the tract appear to have a bearing on the disease. The soil is heavy and distinctly alkaline, the reaction varying from pH 8·4 to 8·8 up to a depth of 12 feet. The water table at the beginning of the rainy season averaged 6·8 feet. The trees are flood-irrigated at intervals of about ten days and the irrigation water comes in direct contact with the trunk. Flooding also stifles proper aeration of the roots in a clayey soil. The control measures which are designed to remedy all these defects are being tried in the tract by a special staff working under the Deputy Director of Agriculture, II Circle. The following are the treatments followed :—

(1) Digging out and destroying dead trees.
(2) Scraping the cankered bark, excision of stained wood, disinfection of wounds and application of Bordeaux paste.
(3) Pruning of low lying unproductive branches, flush with the stem up to about 5 feet from the ground and protecting the wounds with Bordeaux paste.
(4) Burying manure in trenches away from the trunk as against dumping it close to the trunk.
(5) Change from flood irrigation to ring irrigation—the ring to be 2½ to 3 feet from the trunk.
(6) Pulling away clayey soil from the crown of roots and replacing it with sand.

A start has been made with these treatments and the results so far obtained are encouraging.

(b) *Stump-rot of nursery stock—Diplodia sp.*—Serious loss to valuable nursery plants was reported from Panyam. The roots and collar are attacked by *Diplodia sp.* Here again the pH of the

soil is above 8·2. One remarkable feature is that seedlings are free but the budded plants die out when the stock is lopped above the bud-union. Unlopped budded plants and inarched plants whose leaves continue to function remain free. The disease appears to be analogous in some respects to the stump-rot in the Kistna delta. It is proposed to try during the ensuing budding season the effect of prolonging the function of the leaves of the stock by a system of 'half cut' above the bud union.

(c) '*Mottle leaf*' *or* '*foliocellosis*'.—This disease which is attributed to zinc deficiency is found to a greater or less extent in the orange-growing districts of the province. Spraying affected plantations with a mixture of zinc sulphate and hydrated lime has been tried with success in parts of Cuddapah, Godavari, Chittoor and Salem districts.

8. *Ginger*—'*Soft-rot*'—Pythium butleri.—The soft-rot of ginger is a menace to the industry of the West Coast where there are 18,000 acres under ginger. As no reliable methods of control are known, a detailed study of the disease was started. The following are the main findings :—

(1) The fungus is present in ginger soils. It can be isolated from ginger soils by raising wheat seedlings in the soil and culturing the fungus from wheat roots (Vanterpool's method).

(2) Oospores of the fungus are detected on the scale leaves of preserved seed rhizomes. Under certain conditions, the fungus develops in storage and attacks rhizomes.

(3) Successful inoculation experiments were conducted on the following plants : Melon, pumpkin, cluster bean, cow pea, tobacco, brinjal, chilli, papaya, amaranthus, wheat and dioscorea. Cotton failed to take infection. The fungus is evidently an unspecialized parasite with a very wide host range.

(4) The fungus tolerates a very wide pH range (4·0 to 8·13). The optimum is in a range above pH 7.

(5) Among four ranges of temperature tried the best growth was at 30—31°C.

(6) The fungus grows profusely on sterilized organic substances like groundnut cake and paddy bran, moderately on gingelly cake and cattle manure and sparsely on bone meal. There was no growth on leaf mold.

Control measures.—The study of the fungus suggests that a suitable seed dressing should be attempted before and after storage of rhizomes. Since this class of fungi is known to be aided by a high N/P ratio, the possibility of combating the disease by the inclusion of phosphatic manures in the existing manurial practice needs investigation. Experiments are now in progress to study these aspects.

II. Plant virus investigations.

Several virus diseases came under notice during the **period** under report. It has not been possible to do more than a cursory study of these for want of virus house facilities.

1. *Sugarcane mosaic—Varietal resistance.*—The annual field trials to estimate the relative resistance of cane varieties were continued. In the check variety (Co. 213) the percentage of infection was 86 as against 70 last season. A consolidated statement showing the varieties tested during the last five seasons and percentages of secondary infection as given in the table below :—

Sugarcane mosaio—Varietal resistance trials—1933-34 to 1937-38.

Serial number.	Varieties tested.	Number of years under trial from 1933.	Percentage of infection.				
			1933-34	1934-35.	1935-36.	1936-37.	1937-38.
1	Co. 205 Pusa	5	Nil.	Nil.	Nil·	Nil.	Nil.
2	Co. 213	5	95·0	95·0	63·5	70·0	86·0
3	Co. 335	5	Nil.	Nil.	Nil.	Nil.	Nil.
4	Co. 360	5	73·0	81·5	55·4	56·0	67·0
5	Co. 361	5	70·0	55·5	53·4	40·0	78·0
6	Co. 355	4	..	Nil.	Nil.	Nil.	Nil.
7	P.O.J. 2878	4	Nil.	Nil.	Nil.	Nil.	..
8	Co. 363	3	39·0	17·0	11·4	..	..
9	Co. 402	3	7·5	13·0	13·4	..	..
10	Co. 408	3	31·0	13·5	37·5	..	..
11	Co. 412	3	8·5	10·5	7·2	..	..
12	Co. 205	2	Nil.	Nil.	..	..	..
13	Co. 353	2	..	..	5·4	Nil.	..
14	Co. 354	2	..	55·0	55·0	..	..
15	Co. 407	2	..	..	.	8·0	37·0
16	Co. 411	2	..	4·0	1·9	..	..
17	Co. 413	2	..	4·0	Nil.	..	..
18	Co. 417	2	..	49·0	43·5	..	..
19	Co. 419	2	..	43·0	43·6	..	..
20	Co. 434	2	..	..	..	Nil,	Nil.
21	Uba	2	..	..	..	Nil.	2·0
22	B. 3412	1	70·0	..	..	..	..
23	E.K. 28	1	85·5	..	..	..	..
24	Poovan	1	62·5	..	..	..	..
25	Vellai	1	79·5	..	..	..	..
26	Pundia	1	..	..	25·6	..	..
27	Co. 229	1	..	..	Nil.	..	..
28	Co. 313	1	..	..	63·4	..	..
29	Co. 326	1	..	..	Nil.	..	..
30	Co. 331	1	..	..	38·0	..	..
31	Co. 352	1	..	..	..	Nil.	..
32	Co. 356	1	..	..	Nil.	..	..
33	Co. 364	1	..	..	..	..	..
34	Co. 404	1	..	..	..	..	44·0
35	Co. 414	1	..	..	..	..	49·0
36	Co. 415	1	..	..	..	..	62·0
37	Co. 416	1	..	..	..	..	10·5
38	Co. 421	1	..	..	..	62·0	..
39	Co. 422	1	..	..	24·3	..	..
40	Co. 423	1	..	..	..	Nil·	..
41	Co. 426	1	..	..	..	70·0	..
42	Co. 429	1	..	..	43·1	..	..
43	Co. 432	1	..	..	39·9	..	..
44	Co. 433	1	..	..	..	18·0	..
45	Co. 438	1	..	..	..	..	45·5
46	Co. 508	1	..	..	..	23·0	..
47	Co. 511	1	..	..	Nil·	..	..
48	Co. 513	1	..	..	..	..	Nil.
49	Co. 520	1	..	..	..	..	66·0
			..	..	..	..	36·0

2. Solanum melongena—*Little leaf and bunchy top.*—A disease affecting brinjal was noticed in several parts of the province. The characters of the disease are reduction in size and alteration in shape and texture of leaves, shortening of nodes and sterility. Sap-transmission did not succeed, but successful infections were obtained by grafting on brinjal and *Datura fastuosa*. Symptoms developed in 21 days on new growth. The disease is a serious one on the brinjal crop.

3. *Potato viruses*—(*a*) *Simple mosaic.*—Inoculation experiments were done at Coimbatore and Nanjanad. A disease producing mild mosaic symptoms on Sharpe's Express was found to be sap-transmissible to *N. glutinosa*.

(*b*) *Aucuba mosaic* (Solanum virus 9 Smith).—Two cases of successful sap inoculation from potato to potato were obtained with this virus.

4. *Tobacco viruses.*—A rapid survey of the tobacco areas in Coimbatore and Salem districts was made with a view to ascertaining the extent of virus diseases in the crop. The following diseases were noticed :—

> 'Mosaic,' 'Ring spot,' and 'Leaf curl and Kroepeck.' Transmission experiments indicate the existence of a number of strains of mosaic. One strain of mosaic which produces mottling on tobacco and local lesions on *N. glutinosa* was found to be transmissible to chillies, but not to *Datura fastuosa*. The thermal death point of this virus was in a range of 87–88°C at 10 minutes exposure. It was found viable after four months in dried material. A leaf curl resembling Thung's 'Kroepeck' disease was noticed for the first time this year. The leaves are twisted and leafy out-growths appear on the veins on the lower surface. Sap-transmission failed but grafting gave positive results in eighteen days.

III. Miscellaneous investigations.

1. *Cereal rusts.*—The assistant attached to the "Cereal rust investigations" of the Imperial Council of Agricultural Research was engaged in the study of the epidemiology of rusts in the hills and plains. In the Nilgiris, the black, brown and yellow rusts of wheat, the dwarf and yellow rusts of barley and the black rusts of oats were found throughout the year. In the Palni hills, only the brown rust of wheat is found throughout the year. The 'prevalence' and 'destructiveness' of brown rusts were found higher in the Nilgiris than in the Palnis and consequently the former are more important foci of infection.

At Coimbatore, 'black rust' was first observed on 10th September 1937 on a June sown wheat, while 'brown rust' was first noted on 28th September 1937 on the July and August sown wheat. This period is coincident with heavy infection on the

first season crop in the Nilgiris. The period of high infection at Coimbatore is from December to February with the peak period in January.

2. *Rusts of millets.*—From examination of aeroscope slides it was found that spores of *Puccinia purpurea, Puccinia penniseti* and *Uromyces setaria-italica* are in the atmosphere throughout the year, but maximum infection takes place in December-January.

3. *Cloves—Bark rot.*—A disease of clove trees characterised by the splitting and flaking of bark was found in Burliar gardens and in an adjoining plantation. Fructifications of a species of Ganoderma were found on dead wood and branches. Pruning of dead branches, scraping of bark and painting the wounds with Bordeaux paste were tried.

4. *Cotton wilt—F. vasinfectum.*—A comparative study of the cotton and redgram wilt fungi showed that they are physiologically different strains. The cotton strain does not pass to redgram and vice versa. A third strain was isolated from chilli plants. These fungi are under study.

5. *Cardamom diseases.*—(*a*) A mosaic disease apparently of virus origin and characterised by 'mottling' of the leaves and tender shoots is common on Anamalai plantations. Since cardamom is usually propagated vegetatively, the disease is spread through 'slips' taken from infected stools. This does not however preclude the minor menace of secondary infection from plant to plant by an insect vector. Since the virus is not transmitted through true seed, seed propagation, systematic roguing of infected stools and breeding and selection for mosaic resistance are the most fruitful means of control.

(*b*) *Rhizome rot.*—A species of cephalosporium was isolated from affected rhizomes. Inoculation experiments showed that the fungus causes a soft rot of tender rhizomes.

(*c*) *Leaf spot—Cercospora sp.*—A leaf spot of seedlings was recorded during the year. Half per cent bordeaux mixture is being tried as a control.

6. *Ceresan as a seed dressing for tobacco.*—Fumigation with formalin and potassium permanganate was found too drastic for tobacco seed. Ceresan at the rate of one gramme per pound of seed was found to be harmless even after a period of three months.

IV. Advisory work.

One hundred and twenty specimens of plant diseases were received for examination and advice. Besides these, several enquiries relating to plant pathological problems were answered by correspondence.

V. Propaganda and campaigns.

I participated in two important campaigns in collaboration with the Deputy Director of Agriculture, VII Circle.

The *Mahali* campaign during the year was a great success. The receptive mood among areca growers and the sanction of a special staff for the work contributed greatly to the success of the campaign. It may now be confidently stated that there is no grower in South Kanara who is unaware of the benefits of spraying. But to obtain lasting benefits, ways and means have to be devised to prevent profiteering in sprayers and chemicals and to supply them to needy ryots on the security of their produce. Samples of different models of sprayers were imported and tested before information on sources of supply and prices were given to importers. Local manufacture of sprayers was encouraged by visiting the works and rendering advice on possible improvements. Co-operative societies and private enterprises were periodically given advice about the current prices of chemicals and sprayers. It is gratifying that 97 to 99 per cent of the area under arecanuts was sprayed in some of the important areca centres in South Kanara.

Bud-rot of palms.—A sub-assistant in mycology, a mycology demonstrator and a special revenue inspector continued to be on special duty. Close contact was maintained with the revenue officials for the efficient working of the Act. A special survey was made of the Walluvanad taluk.

VI. Quarantine service.

Forty-three consignments of seeds and plants meant for despatch to foreign countries and samples drawn from nine consignments of cargo were examined and quarantine certificates issued.

Miscellaneous.

Microtome section.—Six hundred and thirty-two materials were received, 441 embedded, 298 blocks cut and 1,592 slides prepared during the year for officers in the institute and in the districts.

Special lecture.—I delivered a special lecture at the College on "diseases of plants caused by mineral deficiencies."

Coimbatore,
7th May 1938.

K. M. THOMAS,
Government Mycologist.

ADMINISTRATION REPORT OF THE RESEARCH ENGINEERING SECTION, COIMBATORE, FOR THE YEAR 1937–38.

1. *Charge.*—Mr. N. G. Charley, Research Engineer, remained in charge of the section except for a period of leave from 13th May to 8th October, when I held additional charge of the section.

2. *Ploughs.*—This year's figures relating to sales of approved ploughs through departmental depots and direct from firms show a substantial increase over those of last year. Of the number of different types sold, Messrs. Cooper Engineering Works, Satara, lead with 3,256 followed by Messrs. Kirloskar Brothers claiming 1,915 and Ransomes reported at only 86 making an encouraging grand total of 5,257. Compared with the total sales last year these figures show a 40 per cent increase. Cooper No. 11 continues to gain ground as a cheap and efficient plough having large sales. Cooper No. 25 and Kirloskar's Gurjar No. 2, both similar in size, are in great demand and coupled with the type mentioned above have practically eliminated foreign ploughs from the field.

The new light ridge plough designed by the section last year and now produced by all the leading implement manufacturers has been well received although the price still remains the same at Rs. 10–8–0. Over 235 of these ridgers are reported to have been sold during the short period of the year in which it was put into manufacture.

The Cooper No. 34 plough was tested in the districts and reported favourably. Its performance is as good as the Ransomes' Victory plough and costs only a fourth of the latter. The share is provided with a slip nose point. It has since been copied by Messrs. Kirloskar Brothers, and P.S.G. & Sons Charity Industrial Institute, Peelamedu, and samples have been received from them for test.

A sample of their Garden turnwrest plough was received from Messrs. Cooper Engineering Works, Satara, and was returned to the firm with suggestions for further improvement in design.

The Baroda plough with left hand mouldboard received from Messrs. Kirloskar Brothers is under test.

Two bar point ploughs were received from Messrs. Cooper Engineering Works for trial. One was sent to the Guntur Agricultural Research Station and another to the Agricultural Demonstrator, Coimbatore. The plough sent to Guntur has been reported satisfactory and trials are in progress with the one sent to Coimbatore.

A Gibbins reversible disc plough was imported from Messrs. Gibbins Farm Implement Company, Melbourne, Australia, at a cost of Rs. 247–5–0.

3. *Cultivators.*—The five-tyned John Deere cultivator purchased from Messrs. William Jacks & Co., was tested and approved. It is similar in design to the well-known Planet Junior make and the McCormick Deering make.

4. *Earth Scoop.*—On almost identical lines as the 3 cubic feet size, a smaller one with a capacity of 2 cubic feet was designed, tested and after satisfactory trials passed on for production. This has a comparatively lighter draught and should meet the requirements of smaller cattle. Its cost is only Rs. 10 and that of the 3 cubic feet Rs. 12, a slight reduction having been effected. The implement is simple to operate and can be employed for levelling fields, excavation of channels and drains and other operations requiring soil transport.

5. *Seed Drill.*—Marked improvements have been effected in the mechanical seed drill. Previously accommodated between the wheels, the furrow opener bar has now been located just rear of the wheels where its length, and consequently the spacing between the furrow openers, suffer no restriction due to the wheel spacing; and the wheel spacing or track no longer determined by the length of the furrow opener bar, has been reduced from 5′ to 3′–9″. This rearward movement of the furrow opener bar has called for a change from the previous bevel gear drive to a belt drive, but the change has been satisfactorily effected by the employment of cast iron 'V' pulleys on the axle and seed distributor shaft and a Goodyear automobile fan belt. A hand lever has been provided on the front of the drill by means of which the driver can very conveniently raise the furrow openers out of the ground while turning at the headlands, the depression of the lever causing the whole drill frame including the furrow openers to tilt forward on the axle. The depth of the furrow openers in the ground, that is the depth of sowing, is also controlled by the lever or rather an adjustable pin in the lever quadrant which determines the extent of the lever's backward movement and consequently the backward tilting of the drill frame and the lowering of the furrow openers into the ground. The clutch has been made automatic in action; the depression of the lever causes it to disengage, and, when the lever is released and rises, the clutch engages automatically under the influence of the weighted arm.

The seed distributor remains the same, but wooden block bearings and wooden frame members have been substituted for iron parts, and the weight, draught and cost have all been appreciably reduced.

The drill in its new form has been tested with highly satisfactory results and will be subjected to extensive trials in the districts during the coming year.

6. *Basin Furrower.*—A simple bullock-drawn implement has been devised for the purpose of basin listing or basin furrowing as developed and practised with such marked success in America

for moisture conservation and soil erosion control. The implement consists of a light furrowing plough associated with a pair of wheels and axle in such a way that a cam on the axle causes the beam of the plough to rise and fall so that the furrow is discontinuous and consists of a series of short furrows or basins which effectively trap and hold the rainfall until it is absorbed by the subsoil. The implement was first tested in December in hard, gravelly, red soil near Anantapur, and gave a very satisfactory performance, and three more implements have since been made and supplied for use in Kurnool, Bellary and Anantapur districts where the system of basin furrowing is being put to test.

7. *Disc Roller.*—A new bullock-drawn implement has been devised by Sri M. Anandan, Superintendent, Agricultural Research Station, Aduturai, for the incorporation of green manure into the puddle in paddy land cultivation. It comprises a simple frame with a rotating axle on which are mounted a number of discs at a uniform spacing and may thus be appropriately termed a disc roller. In operation the roller is merely drawn over the layer of green manure which has been cut and spread over the field and the discs press the manure into the puddle to a depth of two or three inches. The action is most effective, one passage of the roller serving to completely bury the manure, and the implement is very light in draught and easily managed.

The design has been refined in the Research Engineering Workshop and now employs a steel axle on which are fitted five circular discs of 3/16″ steel plate, one foot in diameter. Distance pieces of piping which are slipped over the axle between the discs preserve the spacing of the discs at 9″ intervals, and the whole assembly is clamped tightly between the ends of the axle which are screwed and provided with large nuts and washers. The axle is free to rotate in two wooden block bearings attached to the ends of two light angle iron members which form the frame and drawbar of the implement.

Samples of the implement are now being sent out for trials in the districts.

8. *Wet land puddling implement.*—Trials were continued with the new spade and blade rollers designed for puddling purposes. The design has been altered giving the blades an angular setting in relation to the axle resulting in better penetration and giving a ploughing action. For lightening the draught the length has been reduced and an ordinary pair of bullocks are able to drag it without undue strain. Further improvements are in progress to carry out extensive trials during the year. The implement holds a promising future as a puddler and as a green manure trampler for wet cultivation and a clod crusher for dry cultivation.

9. *Chaffcutters.*—Hand-power circular chaffcutters received for trial during the year include the machine made by Messrs. Cooper Engineering Works, Satara, the Lal Toka and Cheap Toka

machines made by the Government Industrial School, Lyallpur, Punjab, the "Aster Special" made by Messrs. Aster Engineering Company, Delhi, and a fourth make sold by Mr. R. J. D. Wahi of Delhi.

The Cooper make was tested and further modifications were suggested by the section for its improvement.

The Toka machines are of robust design, well built and provided with strong, large diameter wheels which make for smooth, easy working. The Lal Toka machine is equipped with 9″ rising mouth, and the Cheap Toka with 8″ rising mouth. The diameter of the wheels of the Lal Toka and Cheap Toka machines are 42″ and 36″ respectively. The Lal Toka is provided with weighted lever action and the Cheap Toka with spring action, and the gearing in both cases provides a length of cut of about 5/8″. The former which is the better machine is equipped with four heavy cast iron legs, cast in two pairs, and priced at Rs. 50, ex-Industrial School, Lyallpur. The latter is fitted with four steel legs with flat iron bracing and priced at Rs. 35 ex-Industrial School, Lyallpur. These are the best machines so far seen in South India. The prices ex-factory are reasonable, but the heavy additional freight charge to Madras Presidency makes them rather prohibitive, and local manufacture will have to be resorted to in order that the machines may be made available at attractive prices.

The Aster machine is equipped with 8½″ rising spring mouth, four steel legs with flat iron bracing, and 40″ diameter wheel. The design and construction are satisfactory, and the price of the machine is Rs. 30 f.o.r., Delhi.

The Wahi chaffcutter is of satisfactory design but of crude and defective construction and has been found unacceptable.

10. *Winnowing machines.*—Trials were conducted with the Ramprasad winnower received last year. It was not found satisfactory and returned to the makers.

Messrs. P. S. G. & Sons have been requested to make a winnowing machine after the design of English made winnowers, and they have taken up the work.

11. *Manure distributor.*—A hand-distributing device for artificial manures has been designed at the suggestion of Sri T. K. Thangavelu, Agricultural Demonstrator, Ootacamund, for use in the cultivation of potatoes in the Nilgiri Hills. The usual practice of the cultivator is to take the manure in handfuls from a basket or bucket and throw it along the furrows as he proceeds from end to end of the furrows. The new distributor consists of a funnel or inverted cone-shaped container of thin galvanized iron sheet which is carried in the hand at full arms length by means of a handle which extends across the open top of the container. The apex of the container is provided with a conical wooden plug

or valve which is mounted on a rod extending up through the centre of the container to the handle. The depression of the rod, against the action of a small coil spring, causes the valve to move off its seat and the manure flows out through the annular opening in a thin cylindrical fall. The opening of the valve and the rate of flow depends on the extent to which the valve rod is depressed and this is under the continuous and easy control of the hand which carries the distributor.

The device is extremely light and simple, and has given very satisfactory results. The area under potato cultivation on the Nilgiris is said to be approximately 13,000 acres, and it is likely that a device of this nature, if it can be made available at a very cheap rate, will find favour with the growers.

12. *Stalk-pullers.*—An improved type of stalk-puller was designed and sent out for trials. Experiments conducted with the device for pulling out cotton stalks, green manure plants (*Sesbania speciosa*) and castor plants, showed its efficient performance. These pullers do good work even with thick stems.

13. *Pitting crowbars.*—Samples of improved pitting crowbars for digging pits for planting sugarcane setts and bamboo props, were designed following the principles adopted by Sri L. K. Narayanan, Agricultural Demonstrator, Shiyali, and despatched to the agricultural research stations for trial. The working of the crowbar has been reported as satisfactory and represents an advance over the ordinary sharp pointed one.

14. *Ce. Co. Co. paddy husking machines.*—Messrs. P. S. G. & Sons submitted a sample of their paddy husking machine, copy of the Japanese made Ce. Co. Co. machine. It was returned with instructions to rectify certain defects and for effecting further improvements.

A power operated Ce. Co Co. machine was received from Messrs. P. N. Rangaswami Naidu & Co., Coimbatore, and was tried with satisfactory results.

Paddy husking experiments were conducted and the following results have been obtained :—

	Cleaned rice obtained from one salagai or 154 lb. of paddy.	Percentage of rice to paddy.
	LB.	
Milling at the rice mill ..	99	64·3
Hand pounding	103	66·9
Ce. Co. Co. hand-operated rice huller	111½	72·4
Ce. Co. Co. power huller ..	115	74·7

15. *Water-lifts.*—Further minor improvements were carried out to the improved circular mhote and the device entered for the Imperial Council of Agricultural Research award of prizes and

medals for improvements in water-lifts. The Provincial Agricultural Research Committee have reported this lift to be a distinct improvement over the existing type and simpler to handle.

Two such lifts were erected on private farms, one at Akkanur, South Arcot district, and the other at Nagari, Chittoor district, and a third at the Agricultural Research Station, Anakapalli, for trial. The first two lifts have since been purchased by the parties.

A Persian wheel water-lift was fitted up in one of the ryots well in Attur taluk of Salem district and another at the Agricultural Research Station, Kalahasti. All the above lifts are functioning satisfactorily.

16. *Pneumatic rubber-tyred carts.*—Five years' experience with pneumatic-tyred bullock carts shows that the change over has given complete satisfaction in all respects. Treads of tyres of this special bullock cart tyre equipment show comparatively little wear and are still capable of many more years of useful service. The replies received to the questionnaire issued to about a dozen ryots to whom the demonstration cart was given for use, reveal satisfaction regarding its performance and express their willingness to go in for this type although the prices are nearly $2\frac{1}{4}$ times that of an ordinary country cart.

Orders received for such pneumatic-tyred carts from ryots are now passed on to Messrs. P. S. G. & Sons Charity Industrial Institute, after detailing the specifications for regular manufacture. Such carts are inspected during execution at their Institute workshops and approved before they are passed on to the parties. Similar equipment is now adopted with advantage for hand carts, trolleys and wheel barrows.

17. *Miscellaneous works.*—The construction of rubber-tyred carts for the Agricultural School Farm, Kalahasti and Livestock Research Station, Hosur, a rubber-tyred wheel barrow for the Paddy Specialist, a four-wheeled rubber-tyred trolley for the Oil-Seeds Specialist, and two-wheeled trolleys for the Millets Specialist and Cotton Specialist the design and manufacture of an improved pipe stand for steel yard or spring balance types of weighing instruments, the manufacture of improved circular mhote water-lifts for supply to several purchasers, the overhaul of two Robinson's anemometers for transfer to the Cotton Specialist, the design and manufacture of an improved cotton stalk puller for distribution to the districts for trial, repairs to the psychrometer for the Paddy Specialist, the manufacture of a pair of steel gates for the Nanjanad Research Station, a cotton sieve for the Agricultural Demonstrator, Udamalpet, and laboratory apparatus for the Cotton Specialist, the manufacture of turmeric polishing machines for distibution to turmeric-growing centres for demonstration and hire, hand seed sowers for attachment to country seed drills, and bullock harness for supply to various research stations, repairs of cotton gin for the Agricultural Research Station, Guntur, the manufacture of V-Notch

plates for the Section Officer, Public Works Department, Adoni, overhaul and repair of implements and machines received from the Central Farm and research stations, etc.

18. *Conferences, lectures, etc.*—Mr. Charley attended the second meeting of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry at Lahore, from 6th to 11th December, and read a paper entitled " A Review of the Past History and Appreciation of the Present Position with regard to the Improvement of bullock-drawn implements with suggestions for the future."

Mr. Charley delivered a special lecture on 31st January 1938, to the students of the Agricultural College on the latest improvements and advances in Agricultural Engineering.

19. *Exhibitions.*—The section participated in the exhibition held in connexion with the College Day and Conference in the third week of July 1937. Improved ploughs, working models of water-lifts, new types of rice-shellers and polishing appliances, turmeric polishing machines, earth scoops and a variety of other implements and machines pertaining to the work carried on here were displayed with illustrated charts and diagrams in which the visitors showed keen interest. Exhibits of improved ploughs, seed drills, turmeric polishers, etc., were also sent to Madras for the All-India Khadi and Industrial Exhibition held in the Congress House in December-January, and to the Swadeshi Exhibition held at Coimbatore in March-April this year.

20. *Publications.*—Illustrated departmental leaflets on the turmeric polisher and earth scoop were published during the year, and similar leaflets on the improved circular mhote water-lift and the bullock harness, referred to in last year's report, have been prepared for publication.

An article on turmeric polisher was sent for publication in the Agricultural and Livestock Journal of the Imperial Council of Agricultural Research.

21. *Training in agricultural engineering.*—Three upper subordinates from the I, II and III Circles have been deputed for training in agricultural engineering in the section for three months, and they reported for duty on 21st February 1938.

B. M. LAKSHMIPATHY,
Research Engineering Section.
Estate Mechanical Engineer-in-charge,

2nd May 1938.
LAWLER ROAD P.O.,

ADMINISTRATION REPORT OF THE CURATOR, GOVERNMENT BOTANIC GARDENS, OOTACAMUND, FOR THE YEAR 1937–38.

Charge.—I was in charge of the office of the Curator throughout the year under report.

2. *Government Botanic Gardens, Ootacamund*—(*a*) *Season.*—The total rainfall was 54·59 inches as against 54·08 inches last year. There were 160 rainy days against 178, and the heaviest rainfall was 4·01 inches recorded on the 1st of October. Heavy showers were experienced in July when 8·49 inches were recorded. The month of January was completely dry. The gardens did not suffer from scarcity of water due to the uniform distribution of rain.

The maximum and minimum temperatures ranged between 71° and 81° F. and 26° and 55° F., respectively. The highest temperature was recorded towards the end of March and the lowest during the first week of December and third week of January.

Quite unusual frosts occurred early in December which caused considerable amount of damage to the lawns, flower beds and also to the shrubs.

(*b*) *Condition and maintenance of the gardens.*—The gardens were as usual maintained in good condition. All the flower beds and herbaceous borders were planted with annuals and perennials. Five hundred and ninety blue gum seedlings were planted out in the vacant space above the coolie lines and these are growing fairly well. Buxus edgings on the band stand and fountain terraces were replanted wherever necessary. The work of returfing the lawns was continued. The pipe line from the public conservatory to the seed-testing garden was repaired. Among the important works undertaken for the improvement of the garden, the following may be mentioned :—

A number of *Jasminum primulinum* creepers were planted along the railings above the band stand. One *Erica Mediterranea* was planted in the band stand just opposite the existing plant of *Erica arborea*.

Ten terracotta flower vases were fixed on the band stand parapet wall and planted with Geraniums and Nasturtiums. A small gate was provided in the middle of the parapet wall with a few steps leading into the pond in order to facilitate the watering of the flower-beds. A round bed was newly opened near the office.

Cytisus supinus, *Genista Andereanea*, Linum-perennial (blue), *Ionopsidium acaule*, *Mesembryanthemum Criniflorum* were in bloom in the open and also Primula and Phyllocactus hybrids under glass.

The two conservatories were kept in good order being constantly replenished with flower and foliage plants. The most

noteworthy plants in flower were Cinerarias, Hybrid Phyllocactus, Geraniums, Pelargoniums in different shades, Schizanthus, perpetual Carnations and also a few Orchids.

(c) *Nursery work.*—All the glass houses (Nos. 1 to 7) and the hardy nurseries received special attention. Different varieties of seeds were sown and the propagation of plants was continued. A new rockery was made behind house No. 2 and planted with various succulents and rock plants. Just near the entrance to the nursery two rows of Cypress seedlings were planted to form a hedge. In all 473 packets and 3 lb. of seeds were sown and many thousands of plants and seedlings raised.

(d) *Introduction of plants and seeds.*—The different varieties of trees, shrubs and creepers received from the Superintendent, Government Gardens in Mysore, Lal Bagh, Bangalore, are still under glass and will be planted in the open during the monsoon.

The following bulbs were purchased from Ernest Benary, Erfurt (Germany) :—

Achimenes	100
Begonias, single and double mixed ...	160
Gesnera hybrida	25
Tydæa hybrida	50
Gladiolus, special mixture	525
Dahlia mixed	350
Lilium speciosum rubrum	10
Montbretias	225

These were either planted in the flower beds or potted for conservatory use.

Four hundred and fifteen packets of flower seeds were also imported on payment for the requirements of the garden and conservatory.

The following is the list of noteworthy plants, bulbs, etc., received from persons or societies :—

(1) Messrs. Ghose & Co., Darjeeling ..	52 Orchids (2 in each variety).
(2) The Superintendent, Government Gardens in Mysore, Lal Bagh, Bangalore.	28 Ornamental trees and shrubs. 8 Creepers.
(3) Mrs. Maggs, Ootacamund ..	50 Giant Violets. 12 Delphinium belladonna.
(4) F Cooke, Esq., Coonoor ..	8 Schizostylis.
(5) J. G. Fritchi, Esq., Coonoor ..	12 bulbs of Lilium longiflorum.

In addition, 70 packets of seeds were received from different gardens and private individuals as a contribution to the garden including 20 packets of seeds obtained from the Royal Horticultural Society, London, and presented by me.

(*e*) *Distribution of plants and seeds.*—One thousand four hundred and forty-seven trees and shrubs, 6,495 seedlings, 319 bulbs and bulbous plants, 156 cuttings and 26 lb. of tree seeds and 104 packets of flower seeds were sold. Thirty plants, 42 bulbs, 1,775 seedlings and 6 oz. and 24 packets of seeds were supplied gratis or in exchange. Besides five colleges were supplied with Botanical specimens for class work and examination.

(*f*) *Plant breeding.*—Different species of Lilies were cross-pollinated under glass, but these have failed to produce fertile seeds. The Hybrid Primulas raised from seeds have all started to bloom, the flowers being bigger than those of the parent. A few Hybrid Phyllocactus also have flowered, the colour of the flowers ranging from white to deep pink.

(*g*) *Medicinal plants.*—The cultivation of *Ipomœa purga* (Jalap) was continued. The tubers are now resting. *Lobelia inflata* (Indian tobacco) which was planted in the open was a failure and hence one packet of seeds of the same was obtained from the United States Department of Agriculture, Washington, D.C., and 12 seedlings were successfully raised. These are coming up fairly well. As there are only two plants of *Barosma betulina* (Buchu), a packet of seeds of the same was obtained from the Union of South Africa and sown in the Nursery under glass. The seeds have germinated well.

(*h*) *Fodder plants.*—The trial of the three species of Atriplex (*Atriplex semibaccata, Atriplex nummularia* and *Atriplex muelleri*) as a fodder crop is a failure, as the plants are not thriving, and it is very doubtful whether these can be successfully introduced as a fodder crop on the hills.

(*i*) *Other crops.*—The seeds of *Lupinus angustifolius* and *Lupinus luteus* (Russian edible varieties) were sown in a portion of the Medicinal Gardens. The plants grew well and the seeds of the same are being collected for further propagation. The result of the alkaloid assay of *Lupinus termis* (edible Lupin) from the Government Agricultural Chemist, Coimbatore, is awaited.

3. *Sim's Park, Coonoor*—(*a*) *Season.*—The rainfall was 67·36 inches as against 68·52 inches the previous year. There were 140 rainy days against 157 and the heaviest fall in a day was 5·75 inches recorded on the 7th of April. The wettest month was October during which 13·40 inches were received and the driest month was January with only 2 cents of rain.

The maximum and minimum temperatures ranged between 64° & 87°F. and 35° & 67°F., respectively, the highest being recorded on the 18th of May and the lowest on the 1st of January.

Frosts occurred during the month of January.

(*b*) *Condition and maintenance of the park.*—All the flower beds and herbaceous borders were constantly replenished with suitable annuals and perennials in order to make the park always attractive to visitors. The decorated tree ferns were kept in good

order by the addition of new plants at frequent intervals. The turf and box edgings were replanted wherever it was found necessary.

Further improvements in different parts of the park were undertaken. Six ornamental flower vases were fixed on masonry pillars two at the main entrance and four on the Fountain Terrace.

Two semi-circular beds 80′ × 2′ were made, one on either side of the fourth terrace and planted with cannas, and two beds in the form of a horse-shoe were formed above the Summer Houses Nos. 2 and 3 and planted with Azaleas and white Marguerites, respectively. A circular bed 12 feet in diameter was opened among the tree ferns near rain gauge and planted with choice seedlings.

Four rockeries were built in different parts of the park and succulents of new introductions were planted.

The small island in the lake was connected with the park by means of a rustic bridge of 15 feet span and 3 feet broad.

A drain 98′ × $1\frac{1}{2}$′ × 2′ was constructed near the hollow above the tennis court and faced with stones and the hollow was filled up with silt removed from the lake.

The rugged bank along the car-drive from the entrance to the park up to the nursery gate was properly sloped and planted with shrubs, etc.

Other improvements effected during the year include the planting of succulents and rock-loving plants, tree ferns and ornamental shrubs.

(*c*) *Nursery work.*—The propagation of all the available and oft-demanded species of plants required for flower beds, shrubberies and distribution was carried out in due season. In all, 6,600 cuttings of ornamental trees, shrubs, and herbaceous plants were inserted. The propagation of standard roses received special attention and 215 stocks were inserted and 167 rose buddings were done. During the north-east monsoon all the nursery plants and rooted cuttings were transplanted after the usual application of cattle manure.

(*d*) *Introduction of new plants.*—The following plants were newly introduced :—

Four *Michelia Champaca, red.*
Twenty-four *Oreodoxa regia* (Royal Palm).
Four *Ravenala madagascariensis* (Traveller's tree).

Other newly introduced plants were mostly succulent and rock-loving plants of which two dozen varieties were planted in the rockeries above Summer House No. 3.

Aleurites Fordii (Tung).—There are at present 9 plants, but they have not made much growth during the year. Though one of them flowered, it did not set any seed.

(*e*) *Distribution of plants and seeds.*—Five hundred and sixty-eight flowering plants and shrubs, 92 standard roses and 64 packets of flower seeds were sold during the year. **Further,** seeds of Acacia, Eucalyptus, Pinus, etc., totalling 20 lb. and 9 **oz.** were collected for distribution. One flowering tree and 16 flowering plants were given in exchange to Messrs. Fritchi & Co., Coonoor, and Devappa and Sons, Bangalore, while 18 flowering shrubs were supplied gratis to the Superintendent, Government House Gardens, Ootacamund. A packet of *Jacaranda mimosæfolia* seeds was supplied gratis to the Principal, Forest College, Coimbatore.

4. *General*—(i) *Secretariat Garden.*—As per G.O. Ms. No. 516, Development, dated 1st April 1931, the Curator visited the garden several times during the year and gave technical advice to the park sergeant. Six hundred and seventy-five seedlings were supplied from the Botanic Gardens, Ootacamund, free of charge for furnishing the flower beds.

(ii) *Exhibitions.*—As usual foliage and rock plants were exhibited at the Flower Show of the Nilgiri Agri-Horticultural Society, Ootacamund, in May and this was much appreciated by the public.

(iii) *New works and repairs.*—The special repairs to the Nursery Glass Houses Nos. 7 and 8 in the Government Botanic Gardens, Ootacamund, were carried out during the year.

A garage 20′ × 12′ was constructed in the space between the rest-house and the servants' quarters at Coonoor. Electric lights for the rest-house and the Manager's and Assistant Farm Manager's quarters at Coonoor, were also provided during the year.

The annual repairs to the residential and non-residential buildings, both at the Botanic Gardens, Ootacamund, and Sim's Park, Coonoor, were carried out departmentally.

(iv) *Concession rates.*—The concession rates sanctioned in G.O. No. 2585, Revenue, dated 16th November 1916, to the members of the Nilgiri Agri-Horticultural Society, were in operation throughout the year, and the total discount granted was Rs. 198–7–4 against Rs. 113–11–0 in the previous year.

(v) *Agricultural Show Rooms.*—The show rooms at Coonoor were open to the public throughout the year and a considerable amount of produce was sold there.

(vi) *Library.*—Thirty-nine publications were received gratis and the Gardeners' Chronicle, the Kew Bulletin and the Madras Agricultural Journal were purchased.

(vii) *Horticultural Herbarium.*—Eighty-four specimens of the various annuals and perennials were collected and mounted at

the Agricultural College, Coimbatore. These will be exhibited in a show case. More specimens will be collected during the next year.

(viii) *Visitors.*—Among several who visited the Gardens mention may be made of Sir Arthur Hill, Director of Kew Gardens, the Maharaja of Pithapuram, Mr. C. C. Wilson, Conservator of Forests, Coimbatore, Ismail Sheriff Sahib Bahadur, Curator, Mysore Gardens, Dr. F. H. Gravely, Madras, Dr. B. Chona, Plant Pathologist, Imperial Agricultural Research Institute, New Delhi, Dr. H. G. Gadiyar, Coonoor, Mr. C. H. Burie, Singapore, Dr. and Mrs. H. Savelsbog, Bombay, and Mr. F. C. Scott, F.R.H.S., Bristol, England.

5. (i) *Pomological Station, Coonoor.*—The rainfall was 67·36 inches as against 68·52 inches last year.

(ii) *Planting operations.*—Fifty-seven home grafts of various kinds of fruit trees, such as apples, lemons, pears, pomegranates, etc., and two plants of "Tangelo," varieties "Mongirine" and "Fosterine" were planted during the year.

(iii) *Crops.*—The total yield of fruits of all kinds was 8,072 lb. against 7,964 lb. last year, the increase being mainly under plums.

(iv) *Nursery work.*—Six hundred and forty-two apples, peaches, plums, pears, etc., and 129 oranges, lemons, grape-fruits, etc., were successfully budded during the year; besides, a number of seedlings and plants such as country peach, limes, passiflora, tree tomato, figs, cherimoyers, lemons, pomeloes, etc., were raised. raised.

During the year 380 fruit plants such as apples, peaches, plums, etc., and 176 fruit seedlings consisting of limes, pomeloes, oranges, cherimoyers, etc., were distributed.

6. (i) *Burliar Fruit Station.*—The total rainfall was 72·13 inches as against 73·83 inches last year.

(ii) *Planting operations.*—Five hundred cardamum suckers, 12 plantains, two cherimoyers and 1,000 sweet potato vine-creepers were planted during the year.

(iii) *Crops.*—Six thousand and twenty-one lb. of fruits and 26¼ lb. of spices were harvested against 4,989 lb. and 203 lb., respectively, last year, the increase being mainly under Mangosteens and Durians.

(iv) *Nursery work.*—During the year 3,440 plants consisting of cloves, nutmegs, mangosteens, oranges, bread-fruits, etc., were raised and 1,287 fruit and other economic plants were distributed.

7. (i) *Kallar Fruit Station.*—The total rainfall was 63·97 inches as against 66·43 inches last year.

(ii) *Planting operations.*—Four hundred and eighty-nine plants consisting of sapotas, mangoes, cloves, nutmegs, pine-suckers, etc., were planted during the year.

(iii) *Crops.*—Nine thousand, six hundred and forty lb. of fruits, were harvested during the year against 8,709 lb. last year.

(iv) *Nursery work.*—Ninety grafts and 3,180 seedlings consisting of oranges, cloves, pomegranates, mangoes, etc., were raised during the year and 41 grafts, 1,461 seedlings and 3 oz. of seeds were distributed.

OOTACAMUND, P. A. NATHAN,

30*th April* 1938. *Curator, Government Botanic Gardens.*

Enclosure.

Financial statement for the official year ending with 31st March 1938.

Particulars.	Government Botanic Garden, Ootacamund. Expenditure.	Government Botanic Garden, Ootacamund. Receipts.	Sim's Park, Coonoor. Expenditure.	Sim's Park, Coonoor. Receipts.	Pomological Station, Coonoor. Expenditure.	Pomological Station, Coonoor. Receipts.	Burliar Gardens. Expenditure.	Burliar Gardens. Receipts.	Kallar Gardens. Expenditure.	Kallar Gardens. Receipts.
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
Expenditure—										
To Salaries and allowances.	7,350 1 0	..	1,719 12 0	..	1,703 7 0	..	646 7 0	..	646 7 0	..
Upkeep charges—										
Capital outlay ..	284 15 0	..	22 0 0	..	8 8 0	..	38 11 7	..	37 11 6	..
Working expenses ..	9,744 2 0	..	3,451 14 0	..	2,902 10 0	..	1,610 14 0	..	2,501 14 3	..
Petty construction and repairs.	3,008 2 6	..	712 10 6	..	149 10 3	..	24 0 0	..	24 11 0	..
Other contingencies.	841 12 0	..	257 9 0	..	85 14 0	..	29 6 0	..	31 1 0	..
Receipts—										
Seeds and plants ..	..	1,322 13 6	..	329 13 0	..	..	..	..	..	..
Flowers	..	459 5 0	..	20 4 0	..	..	..	..	..	..
Fruit plants, etc. ..	..	..	..	..	..	507 5 4	..	315 14 3	..	545 11 0
Fruits	..	..	..	..	..	1,131 10 0	..	727 4 2	..	872 5 3
Vegetables ..	..	..	..	..	..	10 15 0	..	..	..	..
Spices	..	..	..	..	..	..	..	31 11 3	..	1 5 0
Rents—										
Rest-house ..	..	..	..	75 10 0	..	..	..	..	..	..
Recoveries of over-payments.	..	..	..	0 4 0	..	..	..	..	..	..
Miscellaneous ..	..	363 6 6	..	82 8 3	..	129 6 0	..	11 3 6	..	10 12 0
XLV. Stationery and Printing.	..	15 9 0	..	..	..	10 14 0	..	..	..	..
Deduct—Refunds ..	..	— 20 2 0	..	..	..	..	..	..	..	..
Total ..	21,229 0 6	2,141 0 0	6,163 13 6	508 7 3	4,850 1 3	1,790 2 4	2,349 6 7	1,086 1 2	3,241 12 9	1,430 1 3
	Profit.	Loss.	Profit.	Loss.	Profit.	Loss.	Profit.	Loss.	Profit.	Loss.
	..	19,088 0 6	..	5,655 6 3	..	3,059 14 11	..	1,263 5 5	..	1,811 11 6

ADMINISTRATION REPORT OF THE PROVINCIAL MARKETING OFFICER, MADRAS, FOR THE YEAR 1937–38.

I submit herewith my Administration Report of the Agricultural Marketing Section for the year 1937–38.

CHARGE.

2. I continued in charge of the section throughout the year except for a period of leave for about two months in July-August when Mr. K. W. Chakrapani Marar, Assistant Marketing Officer, was in additional charge. The four Assistant Marketing Officers. Messrs. K. W. Chakrapani Marar, S. N. Venkataramana Ayyar, M. P. Kunhi Kutti and U. Vittal Rao, continued throughout the year.

MARKETING SURVEYS.

3. The final marketing survey reports in respect of potatoes, ghee and butter, pears, apples and plums and peaches, citrus fruits and also markets and fairs in the Presidency were completed during the year. Copies of these reports were submitted to the Agricultural Marketing Adviser to the Government of India, the Director of Agriculture and the Government. In addition, the surveys of barley, gram, maize, mustard and rape, coconuts, mangoes, sheep and goats, wool and hair were also taken in hand during the year. The data required for the final report on coconuts and wool and hair have been nearly completed, and the reports are expected to be ready soon. Besides the above, a lot of additional data and statistics were collected and furnished to the Central Marketing Staff to enable their reports being brought up-to-date.

4. At the Marketing Officers' Conference held in Simla in September 1937, some more commodities, viz., sugar, jute, lac, cotton, cashewnuts and fish were decided to be surveyed. Cotton has since been deleted from the list, and it has also been decided to take up the survey of sugar in preference to cashewnut and other commodities in the waiting list. The survey of sugar was accordingly taken up towards the close of the year.

EXAMINATION OF COMMERCIAL SAMPLES.

5. For work in connexion with the grade standards, 43 samples—tobacco (3), ghee (20), wool and hair (8), maize (2), barley (2) and cane jaggery (8)—were collected from different markets in the Presidency and sent to the respective officers for analysis. The total number of samples sent so far including those of the previous years is 1,343.

Grades and standards.

6. *Tobacco.*—With the experience gained in the matter of grading tobacco in the previous year, it was decided to make certain alterations in the quality specifications of the different grades of tobacco. It has now been decided to have only five grades in place of the seven grades of unmanufactured, flue cured Virginian tobacco adopted in the previous year. The special characteristics like colour, texture and tolerance have also been slightly altered. The number of grades in sun-cured Virginia and nattu (country) tobacco remains the same, viz., 3 and 5 respectively, as originally fixed, but with slight modifications in grade specifications Duplicate samples of tobacco according to the revised specifications were prepared with the assistance of the Grades Sub-Committee of the Tobacco Association, Guntur, and forwarded to the Agricultural Marketing Adviser to the Government of India, Delhi, for being sent to the High Commissioner, London.

7. *Groundnut.*—A conference of the representatives of associations and mill-owners dealing in groundnuts and the Central and Provincial Marketing staff was held at Bombay in September 1937 when it was decided to have three separate contract forms based on three standard types of Indian decorticated groundnuts, viz., 'Khandesh,' 'Coromandel' and 'Bold.' Specifications like general descriptoin, condition, refraction and allowances, methods of sampling and analysis, etc., were also decided at the conference. The provisional contract terms were subsequently circulated for detailed consideration by the various interests concerned, and the terms were re-examined in the light of observations made by certain associations at a conference held in Delhi in April 1937. A final decision is expected to be reached at a representative conference to be held in Madras in November next.

8. *Grapes.*—The Kodaikanal grapes being of a similar description as the 'Bokri' variety of Poona, it has been decided in consultation with the Agricultural Marketing Adviser to the Government of India to adopt the same grade specifications to the Kodaikanal variety with slight modifications.

Development work.

9. For development work to proceed on sound lines, a full complement of staff and finance are essential especially at the early stages. With this end in view, a comprehensive scheme for the development of agricultural marketing in the Presidency, such as the constitution of a development board for marketing, the organization of Growers' and Traders' Associations, setting up of grade standards in different commodities, standardization of weights and measures, introduction of regulated markets, etc., was submitted in the month of September 1937, and the Government Orders thereon are awaited.

10. Unlike other provinces, however, considerable amount of development work has been taken up in our Presidency in addition to the full work of marketing surveys in hand. A brief summary of the development work done during the year is given below.

11. *Tobacco.*—The grade designations and the quality factors in respect of Virginian tobacco of Guntur district have been described in the previous Administration Report. Samples of the standard grades were prepared and sent to London through the Agricultural Marketing Adviser to the Government of India. The High Commissioner obtained quotations based on these samples, and these were made known to the merchants at Guntur. During the year under report, Virginian tobacco worth about Rs. 50,000 was graded as per the Indian Tobacco Association standard grades and shipped under 'AGMARK' label. Some of the tobacco brokers in London were unwilling to quote separate prices for the different grades. But some of the cigarette manufacturers were surprised that such excellent quality of cigarette leaf tobacco could be obtained in India. When the shipments of graded tobacco increase, it is possible to induce all buyers to quote prices on the basis of the Association grades.

12. Leaflets dealing on cultural, curing and marketing aspects of tobacco were prepared on behalf of the Association for their publication and broadcast distribution among the growers and merchants. Help was also rendered to the Association for the publication of a monthly bulletin giving information on the improved methods of cultivation of tobacco, curing, grading, marketing, periodical statistics of tobacco acreage, condition of crop, stocks, etc. This part of the work is being carried out with the help of a subsidy from the Agricultural Marketing Adviser to the Government of India.

FRUIT AND VEGETABLES.

13. *Oranges.*—For the marketing of oranges in particular, and mangoes, limes and melons in general, a fruit growers' co-operative society was organized at Koduru in Cuddapah district, and it commenced work in May last. The fruits are marketed in Madras through the Provincial Co-operative Marketing Society. The society has sold during the year 8,880 baskets of fruits valued about Rs. 25,000. The members have now realized the advantages of marketing co-operatively, and the work of the society is progressing well. Pooling and grading of fruits and provision of cold storage have been suggested, and it is expected that these will be taken up in the coming year.

14. An Association of the fruit growers of Puttur and neighbourhood in Chittoor district was formed during the year for undertaking the co-operative marketing of oranges produced in the district on the same lines as the Koduru (Cuddapah district) Association.

15. *Mangoes.*—For the marketing of mangoes from Vizagapatam district, a co-operative society of fruit growers of Vizianagaram and neighbourhood was formed during the year. The preliminaries such as establishing contact with North Indian merchants were attended to. Unfortunately, the present season for mangoes has been a failure. The society will, however, be sending a few trial consignments of mangoes to some of the main consuming centres in North India.

16. *Grapes.*—A society for the marketing of grapes was registered at Michaelpalayam in Madura district for the marketing of grapes. The season commenced in January, and during the year under report over 150,000 pounds of fruits, valued Rs. 15,000, have been marketed by the society. Prices have declined this season which is a handicap; all the same the society is progressing satisfactorily.

17. *Bananas.*—As a result of the grant of concessional freight rates for wagon-loads of bananas from some of the producing centres in the Circars to the chief consuming centres in North India, the traffic in bananas has improved, and so far, 34 wagons or over 20,000 maunds have been despatched. This is an advance over the last year when only 20 wagons were exported. The exports to Hyderabad have increased considerably. It is hoped that there will be further increase in the coming season in the export to North India.

18. *Nagpur oranges.*—In response to the repeated request of the Nagpur Orange Growers' Association, the names and addresses of reliable fruit merchants in Madras were recommended. As a result, the Association has entered into direct business with these merchants, and regular consignments of oranges are being received from Nagpur for disposal at Madras.

19. *Pineapple.*—The society for the marketing of pineapples at Tellicherry continued to function. The Association has had to rely solely on Bangalore and Hyderabad for marketing its produce. Enquiries were made this season for fresh markets from various Provincial Marketing Officers, and contact was established with possible places. The South Indian Railway was approached to give concessional freight rates to some of the important consuming centres in South India.

20. *Potatoes.*—Arrangements for the sale of potatoes of the Nilgiris Potato Growers' Association through the Provincial Marketing Co-operative Society were completed by opening a depot in Madras. Arrangements for the opening of depots in the producing areas also are in progress. Potatoes worth about Rs. 3,500 were marketed in Madras direct instead of the usual practice of disposal to established merchants at Mettupalaiyam at low prices. Possibilities of Bombay and other markets were also investigated.

Egg marketing society.

21. It was decided to grade the eggs produced in the Presidency into four grades according to their weight, viz., $1\frac{7}{8}$ oz., $1\frac{3}{4}$ oz., $1\frac{1}{2}$ oz. and $1\frac{1}{4}$ oz., allowing a tolerance of one drachm for accidental errors in weighment. The eggs are cleaned and candled to test their freshness before they are graded. A Central Egg Marketing Co-operative Society was organized recently in Ongole taluk of Guntur district. The society has been located at present in Chinnaganjam in the neighbourhood of which there is a large population of Harijans. The society commenced work in the last week of March, and so far over 10,000 eggs have been marketed. The society has made arrangements to collect the eggs from the members, candle and grade them as mentioned above before sending to Madras for disposal through the Provincial Marketing Society, Madras. A small hand grading machine with the necessary equipment has been placed at the disposal of the society. More societies for the marketing of eggs will be started as work develops at Tanguturu, Ammanabrolu, Ongole, etc.

Ghee marketing.

22. With a view to start marketing of ghee under specific grade standards, investigations were made as to suitable localities. Guntur was selected first, as it produces an eighth of the Presidency's production, i.e., 111,400 railway maunds, and exports annually about 80,000 railway maunds. There are possibilities of taking up grading of ghee in Coimbatore district also. Preliminary discussions and meetings with the merchants and municipal authorities were held in regard to the adoption of the standard grades arrived at the Ghee Conference held in Simla. Further action is being taken in the matter with the Government Analyst, Madras, and the Corporation officers of the Health department. Certain alterations in the standards tentatively fixed at Simla will be made in consultation with the Agricultural Marketing Adviser to the Government of India, before they are finally adopted.

The Provincial Marketing Society.

23. The society is at present dealing with the surplus produce of about 25 commodities belonging to members of various co-operative loan and sale societies in the Presidency. All available data and statistics required by the Secretary of the Provincial Marketing Society were supplied by the Marketing section. The Secretary was also furnished with full information as regards the best methods of marketing various commodities. The names and addresses of reliable merchants outside the Presidency and their terms of business were also furnished in the case of certain commodities. The godowns and sale rooms of the society were visited as often as possible by the marketing staff and necessary advice given. During the year under report, I attended seven

meetings of the Board of Directors of the Society. Policy and lines of work of the Provincial Marketing Society were discussed at these meetings and elsewhere, and suggestions for the successful working of the society made from time to time.

Market intelligence.

24. Weekly prices of rice in Coconada, Nellore, Madras ar Shiyali markets, which were being reported to the Governm are now sent to the Director of Industries. The weekly of agricultural commodities at other important markets in t Presidency are collected by the Director of Industries and pu lished in the *Fort St. George Gazette* and the Madras daili For the information of the public, the list of weekly prices is al exhibited in the offices of Tahsildars, Sub-Registrars and Agricu tural Demonstrators in the mufassal centres. Besides, week wholesale prices at Madras city are being published for such com modities as rice, plantains, jaggery, oranges, limes, eggs, ghe etc., by the Provincial Marketing Society.

Enquiries from the Public, etc.

25. Enquiries from the public and various bodies like Producer Associations, Co-operative Societies and officers of Governme departments, both within and outside the Presidency, in regard market intelligence and statistics are increasing in number fro year to year. During the year under report over one hundred su enquiries were received and attended to. The enquiries covered wide ground and referred to several agricultural commodities.

The Provincial Marketing Board.

26. I continued as the Secretary of the Provincial Marke Board. Three meetings were held during the year. Special con deration in these meetings was given to the reduction of railw rates and similar facilities for marketing. In order to salvage d cows from the hands of the butchers in the Madras city, 50 per ce concession in railway freight was obtained so that milch cow when they go dry, may be cheaply transported to grazing area The terminal tax on incoming milch cattle was abolished. Furth investigation was made as regards the production and trade betel leaves in the Deccan and North India. The present rates on betel leaves are too high compared to the value goods. As a result of the efforts made in this direction, the Gove ment have addressed the Central Railway Board in the matter. The Madras and Southern Mahratta and the South Indian Railways were addressed to reduce the freight rate on pineapples from Tellicherry to some of the important consuming centres in South India. The South Indian Railway have since replied refusing any reduction. The area under pineapples in the West Coast has increased considerably during the last five years. The matter will be further taken up with the railway authorities.